TWENTY-EIGHTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

Massachusetts Board of Agriculture

WITH

THE RETURNS OF THE FINANCES OF THE AGRICULTURAL SOCIETIES,

FOR

1880.

BOSTON:
Rand, Avery, & Co., Printers to the Commonwealth,
117 Franklin Street.
1881.

STATE BOARD OF AGRICULTURE, 1881.

MEMBERS EX OFFICIIS.

HIS EXCELLENCY JOHN D. LONG.
HIS HONOR BYRON WESTON.
HON. HENRY B. PEIRCE, *Secretary of the Commonwealth.*
CHARLES A. GOESSMANN, *State Agricultural Chemist.*
LEVI STOCKBRIDGE, *President Massachusetts Agricultural College.*

APPOINTED BY THE GOVERNOR AND COUNCIL.

	Term Expires.
JAMES S. GRINNELL of Greenfield	1884
JAMES R. NICHOLS of Haverhill	1882
MARSHALL P. WILDER of Boston	1883

CHOSEN BY THE COUNTY SOCIETIES.

Massachusetts	E. F. BOWDITCH of Framingham	1882
Essex	BENJAMIN P. WARE of Marblehead	1884
Middlesex	JOHN B. MOORE of Concord	1882
Middlesex North	A. C. VARNUM of Lowell	1883
Middlesex South	S. B. BIRD of Framingham	1884
Worcester	O. B. HADWEN of Worcester	1884
Worcester West	E. C. FARNSWORTH of Templeton	1884
Worcester North	GEORGE JEWETT of Fitchburg	1884
Worcester North-West	J. P. LYNDE of Athol	1883
Worcester South	SAMUEL N. GLEASON of Warren	1883
Worcester South-East	VELOROUS TAFT of West Upton	1882
Hampshire, Franklin, & Hampden,	J. H. DEMOND of Northampton	1882
Hampshire	FLAVEL GAYLORD of Amherst	1883
Highland	E. H. GOODRICH, JUN., of Hinsdale	1884
Hampden	WILLIAM R. SESSIONS of Hampden	1882
Hampden East	HORACE P. WAKEFIELD of Leicester	1882
Union	HENRY K. HERRICK of Blandford	1883
Franklin	JOHN S. ANDERSON of Shelburne	1883
Deerfield Valley	ARTHUR A. SMITH of Coleraine	1884
Berkshire	HENRY M. PIERSON of Pittsfield	1882
Hoosac Valley	A. W. PRESTON of North Adams	1882
Housatonic	MERRITT I. WHEELER of Great Barrington,	1882
Bristol	AVERY P. SLADE of Somerset	1884
Plymouth	JOHN LANE of East Bridgewater	1884
Hingham	EDMUND HERSEY of Hingham	1882
Marshfield	GEORGE M. BAKER of Marshfield	1882
Barnstable	AUGUSTUS T. PERKINS of Cotuit	1883
Nantucket	ALEXANDER MACY, JUN., of Nantucket	1882
Martha's Vineyard	DAVID MAYHEW of North Tisbury	1883

JOHN E. RUSSELL, *Secretary.*

THE

TWENTY-EIGHTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

BOARD OF AGRICULTURE.

To the Senate and House of Representatives of the Commonwealth of Massachusetts.

THE season under review was benignant and profitable to the farmer. Good harvests, remunerative markets, health, and satisfaction marked the year.

The annual fairs of the societies receiving the bounty of the Commonwealth were conducted less with a view to public amusement than usual, and consequently were more beneficial to the interests of the farmers.

The exhibitions of cattle and dairy products were above the average; the displays of vegetables, fruit, and flowers at all the fairs were extensive and rich, while some were beautiful beyond previous example.

The reports of most of the societies show increased interest, sounder financial position, and valuable results in experiments, carefully made, in regard to the yield and cost of crops.

At the annual meeting of the Board of Agriculture, held in 1878, it was ordered that each society receiving the bounty of the Commonwealth should hold at least three farmers' institutes within the year. Several of the societies were at first apathetic and backward in conforming to this requirement, complaining of it as burdensome and superfluous; but

the past year has seen a notable change of feeling in regard to this rule.

The institutes have stimulated a spirit of inquiry, given opportunity for the exchange of thought and experience, spread knowledge, and awakened enthusiasm. In some counties the meetings held in large halls have been crowded, and, instead of three, as demanded by the rule of the Board, frequent institutes have been held.

This method of agricultural education and means of progress has imposed greatly increased labor upon the secretary of the Board in adding to the correspondence of his office, and demanding his occasional presence in each county of the Commonwealth. Members of the Board of Agriculture have done active service in this direction, cheerfully giving their time to assist the proceedings of the institutes.

HAY, FODDER, AND ENSILAGE.

Well-enriched land stocked down to grass is the most important property of our farms. Upon such land we never fail to secure a fair crop of hay; and its value, whether to feed or to sell, is as near a certainty as any human calculation can be. The belief that our grass-lands will amply repay frequent ploughing and seeding, the removal of useless division-walls and fences, the smoothing of fields to allow free course to the convenient implements in general use, early cutting, less drying, reliable information in regard to weather, are causes that have conjoined to increase the certainty and profit of our staple crop.

In 1875 we cut 671,131 tons of hay. The average price that year was low; and the crop was valued, in the figures of the census, at $10,660,228.

The improved land of 1880 exceeds the tax assessment of 1875 by 27,633 acres. This indicates a large relative increase of mowing-land. The first crop of the past year, owing to a dry spring, fell below the average, but was saved at light expense in excellent condition. The later season was cheered by timely rains, and from good lands remarkable crops of rowen were secured.

The custom of growing fodder to be used green, to assist the summer pastures, is much favored by the best dairymen.

In 1875 the value of forage crops was estimated at $218,669.

In 1876 Mr. Francis Morris of New York, a large farmer in Westchester County, introduced the French method of preserving green forage in tight pits.

This process was first made practicable by the persistent experiments of M. Goffart in France, and published to the world by him. Following the example of Mr. Morris, Mr. Orlando B. Potter of Sing Sing, N.Y., tried experiments upon a very large scale, making the results known in papers read before the State Society of New York, the Farmers' Club of New-York City, and published in various journals. Mr. Potter has made ensilage of red clover, fodder-corn, pearl-millet, West-India millet, and grass. He has also mixed them in the silo, put in layers of various kinds, and always with success when the silo has been tight, well filled, closely trampled, and the forage cut in pieces not more than an inch in length.

This system was first tried in Massachusetts by Mr. J. M. Bailey of Billerica, who has published a manual upon the subject, and done much to bring it to the attention of farmers.

Information in regard to the manner of constructing silos, filling them, and feeding ensilage, has been disseminated by means of the institutes and meetings of farmers' clubs, so that the matter is very thoroughly understood. Silos filled last summer show as good results as those reported by Messrs. Morris and Potter.

The evidence of the persons using the ensilage is strongly in its favor. The success, so far, has met no check, and, if half that is claimed for the system is realized in practice, there will be a great change in our methods of farming. It is proved that silos can be easily and cheaply constructed; that any green crop can be preserved by a simple process; that cattle readily eat it, and that large quantities may be fed without immediate injurious effect; that cattle so fed require but a small quantity of water. It is asserted by the advocates of ensilage that crops of corn-fodder of from fifty to seventy tons can be taken from an acre at a cost of about two dollars a ton. Candid and careful judges, and accurate experiments, both in this country and in Europe, do not put the average product at twenty-five tons, and it is doubtful if a larger yield of a watery, green crop would have a proportionate value.

It is also claimed that cattle may be fed solely upon ensilage; but the evidence shows conclusively that a large amount of corn-meal, bran, or cotton-seed meal has to be added to it; and the question naturally arises, How much is credited to ensilage that should go to the credit of the concentrated food? This aspect of the question would seem to show that at best the ensilage system can be valuable only as an auxiliary in feeding our stock.

How its continuous use will affect the health of cattle and the vigor of the race, is a matter for serious consideration, and can only be determined by time. The Board of Agriculture has taken care that the best scientific information upon the subject shall accompany this report.

DAIRY PRODUCTS.

The product of the dairy is, after the hay-crop, the chief item in our agriculture. The year 1879 was the most unproductive, for this branch of our farming, ever experienced. The season was unfavorable, while the prices of all dairy products were lower than at any time during a generation. The cause of low prices, in the face of expensive and light production, was from complicated economical conditions. In prosperous times our people are great consumers of milk and butter, the use of butter being probably near twenty pounds to each of our population; but the long-continued commercial depression, and the poverty of work-people depending upon manufacturing, had reduced the demand, so that there seemed to be a glut of dairy products. At that time there were not wanting the usual prophets, who predicted that the cause of the low prices was in the fact that the business was overdone, the market permanently overstocked, and that the only branch of agriculture left by Western competition to our farmers could no longer be made profitable. In the latter months of this same year there was a series of economical changes: the business of the country suddenly revived, long-closed mills resumed activity, money returned to the pockets of the people, and there was a rapid rise in dairy products.

The charge that we were ruined by Western competition was at once disproved. We found that we had only suffered from common calamity, and began to enjoy our share of

renewed prosperity. The assessments for local taxes throughout the State indicate a considerable increase in the number of cows kept; and under the stimulus of present prosperity there is reason to look for a very heavy increase in the numbers and value of dairy stock, and in the products of the dairy. But the greater number of cows is not the strongest proof of increased product: the great improvement is in the fact of careful selection, not only of breeds best adapted to our uses, but also a discriminating selection based upon accurate records, of the best individuals in those breeds. There is a wide determination shown in the discussions of the farmers' clubs and the institutes of the State Board to have the best; and the standard of what constitutes a good cow is constantly advancing.

The accurate records kept by some of our farmers, of the product of the best cows in milk and butter, would have been thought incredible until lately.

Forty years ago the number of cows in the Commonwealth was not far from the number now kept. The population has doubled since that time, the great increase being in the cities. This augmented population draws on the country at large for butter and cheese; but milk is mostly supplied from farms within our boundary.

In the smaller towns the demand is fully met in quantity, and competition regulates the matter of quality; but in the larger cities the business is hampered and preyed upon by middlemen and forestallers, who live upon profits that should accrue to the farmer. It is also notorious that they add to their gains by adulteration of the milk.

It is also known that a considerable part of the milk supplied to Boston is the product of cows kept in the vicinity of the city in crowded stables, and fed upon swill and the refuse of breweries.

This condition of the trade is a great restriction upon the consumption of milk, the amount used in the city of Boston being less than half a gill to each inhabitant. If pure milk was freely supplied, there would undoubtedly be a greatly increased consumption. With the co-operation of consumers the abuses of the trade can be corrected. Companies of farmers have demonstrated in the cities of London and Paris that there need be no intervention of middlemen to secure

regular supply and delivery of milk; and it is to be hoped that it will not be long before there will be a union of the interests of consumers and producers in this Commonwealth similar to the organization called the Aylesbury Dairy Company of London that has been very successful in improving the milk-supply of that city.

This is a matter not merely bearing upon the profit of the farmer, but affecting luxury and refinement, the necessities of the poor, and the public health. A reform can only be accomplished by the assistance of consumers.

CORN.

This once important product of the Commonwealth has been allowed to decline, because most of our farmers, during the late years of high-priced labor, have found it impossible to successfully compete with the West.

	Bushels.
In 1855 our crop was	2,595,096
1865 " " "	2,015,771
1875 " " "	1,040,290

We have no means of knowing what it was at the last harvest; but its cultivation, under improved methods, is on the increase, and with a success that must have a great influence in restoring confidence in it as a profitable crop to be generally undertaken.

The Western farmers owe their success to ease of cultivation, rather than to the productiveness of their soil. Our lands yield more bushels to the acre of better corn; but, fixed and conservative in methods, we have persisted in a system of cultivation that, while it is expensive, adds no corresponding value to the crop, and have, consequently, been beaten in our own market.

Our ancestors on the coast found the Indian raising corn in a hill which he manured with a fish. His squaw hoed it with a bone fastened by thongs to a stick, and gathered a satisfactory crop. The Indian method was adopted, with the added advantage of a steel hoe, but with the loss of the labor of the squaw. The cost of the corn-crop has been in the labor of hand-hoeing, the most exigent work of the season, in which the farmer, pressed by the crowding duties

of our short summer, has literally fulfilled the Scripture as to "the sweat of his face."

Forty years ago, Mr. Henry Coleman, then commissioner of agriculture, calculated the cost of labor to an acre of corn at about eighteen dollars. Taking into account the lower rates of wages at that time, and greater value of money, this would be equal to thirty dollars now.

The best crops offered for the premiums of our societies the past year have been made at less than one-quarter of this expense when the tillage has been by the horse-hoe and cultivator. The crops reported have been very large, some of them more than a hundred bushels to the acre.

The economy has been effected by following the Western method of culture, in which a man and horse rapidly do the work that formerly demanded all the energy of the farm. The yield of grain has been increased and the amount of stover lessened by root-pruning, the teeth of the cultivator bringing away large masses of roots to the benefit of the crop. This is the opposite method to the aboriginal practice of hilling up.

The question of corn-culture was made prominent at the late country meeting of the Board of Agriculture at Southborough. The papers, statement of crops, and discussions will be found in subsequent pages.

SHEEP.

In the important matter of sheep-husbandry the farmers of Massachusetts show a fatuity, and disregard of their interests, at variance with their record in other branches of business.

In former days the hills of the western counties were enriched by large flocks of sheep. In 1838 we had 384,614 sheep, mostly Merinos and Saxonies, shearing 1,056,327 pounds of fleece. At that time the business was practically limited to wool-growing, the small fine-woolled breeds being of little value, except for fleece, and the prices of wool dependent upon a struggling woollen-industry. It was proved to our farmers that the wide ranges of cheap lands at the West were better adapted to the business; and the flocks were gradually sacrificed, until, at the last census, we had but 58,773 sheep: these were mostly mutton sheep,

of much greater value than the small, slow-maturing, fine-woolled flocks of our fathers. The times and fashions have so changed, that sheep-husbandry now offers much greater advantages than in former days. The manufacture of woollen fabrics, then a fitful and difficult trade, is now one of the largest and most securely established industries. The demand for wool is not limited to the fine staple: the manufacture of blankets, carpets, flannels, and nearly all the goods used for men's wear, demand the long-staple, coarse wools, such as are produced by heavy, mutton sheep. The average weight of a fleece is now double what it was on the small sheep, and the price of coarse wool is higher than the best Merino or Saxony was in 1840.

Then the average value of sheep was one dollar and fifty-seven cents, and the lambs about the same; now the average value of sheep is about five dollars, and lambs may be calculated at from eight to ten dollars. Increased population, large markets in our manufacturing districts demanding vast supplies of meat, and facilities for transportation from every part of the Commonwealth have so changed all the conditions of sheep-husbandry, that no more profitable business can offer to our farmers.

Dairying withdraws rapidly from the soil the elements of fertility that have to be continually replaced; but the sheep enriches the pasture, and sweet grasses spring under his fertilizing feet.

POULTRY.

At the various fairs the exhibitions of fowls were very large, the competition for premiums keen, and there was much interest on the part of spectators.

The passion for breeding game-chickens, so prevalent a few years ago, was an absurdity in a country where cock-fighting is forbidden by law, and the time and capital of breeders seems now to be given to the more useful families of fowls. The aggregate value of poultry and eggs raised by our farmers amounted, in 1875, to —

Poultry	$263,395
Eggs	903,357
	$1,166,752

Since that time there has been a manifest increase in numbers and quality of fowls and in the value of the product, with a demand constant and highly remunerative. Indeed, it may be safely asserted that there is always a good market for poultry and eggs, upon which outside competition makes little impression.

While this business may be undertaken with small capital, and by those capable only of moderate labor, painstaking intelligence is essential to success. The old way of keeping mixed breeds to roam at large over farms, stealing their nests upon hay-mows or under bushes, has given place very generally to systematic, careful breeding.

There is great incentive to the increase of this business, and a field for enterprise in the French systems of rearing and fattening, that make the poultry and eggs of France notably superior. Their methods are worthy of the study and attention of our poultry-men.

POTATOES.

The dryness of the past summer was not favorable to the yield of potatoes; but the quality was excellent, and the price remunerative.

The annoyance of the beetle, or "potato-bug," continues unabated; but the crop can be perfectly protected by the use of Paris-green, applied either mixed with water, plaster, or damaged flour. Where the latter can be obtained, it is the best means of extension: applied to damp leaves, it adheres better than plaster.

Other poisons are recommended, but their efficacy depends upon their being made of Paris-green; and it is better to use the original article, which requires but one pound of poison to one hundred-weight of flour, or seventy-five pounds of plaster, or, if applied in water, a teaspoonful to ten gallons of water. The best authorities declare, that, owing to the insoluble nature of the poison, none of it can enter into the composition of the tuber.

ROOT-CROPS.

The impetus that was given to the cultivation of sugar-beets by the promise of an active demand, at remunerative prices, from sugar-mills, has met with a check.

It is proved that beets grown on our soil yield well with careful cultivation, and are rich in sugar; but each manufactory must draw its supplies from its immediate vicinity.

The Franklin Works paid six dollars per ton of roots (2,240 pounds), and returned one ton of pulp for each five tons of roots. At this rate but four thousand tons of roots were offered, — not more than one-quarter of the quantity necessary to make a successful season. In order to make a profit on the crop and keep up the fertility of the land, it appears that the beets must be raised in the vicinity of the works, so that the cost of transportation on the roots may be saved, and the exchange of pulp readily made.

The cultivation of the various root-crops that have been grown to assist winter feeding will be very much modified next year by the manifest determination of the farmers to try the system of preserving green crops in silos. It will then be settled, by comparison of experience, which is the more excellent way.

APPLES.

The apple-orchards of the Commonwealth produced a crop so enormous the last year, that farmers were confounded by the immense quantity of fruit that they could not gather, barrel, nor sell. Great quantities were sold at low prices, and several hundred thousand barrels shipped to England; much cider was made, and a vast amount of the fruit fed to stock.

All animals are fond of apples ; but it has long been a question among farmers if they were a proper food for milch cows, much being said on both sides.

The evidence this year seems to prove that cows fed with apples and *concentrated food*, as meal and bran, have done well.

The value of apples as food is stated by Dr. James R. Nichols, an eminent authority, as follows: —

Hubbardstons.

Water	88.57
Albuminoids, pectose gum, and sugar	11.27
Ash	.16
	100.00

Sweet apples contained a greater amount of nutrition. Unripe Baldwins gave eighty-seven per cent of water, with a less amount of albuminoids and sugar than the others. From this it appears that a tree bearing thirty bushels of fruit suspends in the air about half a ton of water; the soluble nutritive material in a bushel of apples being only about six pounds.

The analysis of Early Rose potatoes, also made by the same eminent authority, gives the following value: —

Water	78.01
Albumen, caseine, vegetable fibrine	3.19
Gum pectine and organic acids	3.06
Fat	.05
Starch	13.40
Cellulose and ash	2.29
	100.00

The comparison shows that the potato, as a food, has much greater value than the apple. It may, however, be believed that the apple is of more value than chemistry indicates, because the animals enjoy it: it thus increases appetite, and assists digestion and condition.

The shipments to England on a scale unprecedented will have the effect of creating a market for our fruit there that we have not heretofore enjoyed. Farmers and dealers have found the outlet, and the British public have had the taste of splendid fruit. Another year will see a demand that will be ready to pay higher prices than were realized during the unexpected abundance.

GARDENING.

Part of the agricultural system of the Commonwealth, important in the value of aggregate production, — adding to the variety of our city markets, the luxury of living, and the health and comfort of families, — is the produce of market gardens and the gardening for family use. Of this civilizing adjunct to our economy there are but few accessible returns, the reports of assessors and census-takers not reaching the home branch of production.

The last census of the Commonwealth included a series of inquiries into the affairs of wage and salary receivers of

great value. Among these questions was No. 18, "Value of garden crops raised by you, and used in your family, less all money expenditures on account of the same." The answer to this question showed that the average net value of garden products, gathered by the class to whom the inquiry was directed, was $21 to each male. In Norfolk County it rose to $32.70 for each male. Since 1875, the date of the last census, gardening and fruit-culture by laboring people has largely increased.

Some of the finest exhibitions, at the fairs of the past season, of vegetables, fruits, and flowers, were made by people who do day's work in mills.

The luxury and extravagance of wealth got by speculation is not satisfied unless it produces June in January, and there is great demand for winter fruit and vegetables in New York that is largely supplied by the skilful gardeners of Massachusetts.

The finest rosebuds, grapes, tomatoes, lettuce, cucumbers, etc., are supplied from our hot-houses. There is room for extension of this business in the growing of edible fungi, now largely imported from France, and grown to a limited extent by the gardeners of New Jersey.

SPECIAL MEETING OF THE BOARD.

The Board met at the office of the secretary in Boston, Aug. 25, 1880, at twelve o'clock, having been called together by order of the executive committee.

Hon. Marshall P. Wilder, chairman of the committee, in the chair.

Present: Messrs Baker, Bowditch, Brown, Demond, Gleason, Goessmann, Grinnell, Hadwen, Hersey, Lane, Lynde, Macy, Mayhew, Moore, Nichols, Perkins, Slade, Taft, Wakefield, Ware, Warner, Wheeler, and Wilder.

The chairman made a statement of the object of the meeting, and read the following communication from the secretary: —

State Board of Agriculture,
Boston, June 1, 1880.

Hon. Marshall P. Wilder,
Chairman of the Executive Committee.

Dear Sir, — I hereby place my resignation of the position as secretary of the State Board of Agriculture in the hands of the executive com-

mittee, to take place at such time as the committee may choose to fill the vacancy. Having accepted a more lucrative position, it will be necessary to sever my connection with the office by the 1st of September next. It is a source of profound gratitude, for which I shall always be deeply thankful, that, during my long occupancy of the office, I have always had the cordial and hearty co-operation of the members of the Board and of the public, and I shall never cease to recognize my indebtedness to you and to them.

With the highest respect and consideration,

I am very truly your obedient servant,

CHARLES L. FLINT, *Secretary.*

On motion of Mr. Hadwen the resignation was accepted. Col. Wilder then offered the following resolutions: —

"*Resolved*, That in accepting the resignation of the Hon. Charles L. Flint, secretary of the Massachusetts State Board of Agriculture for the last twenty years or more, we tender him our most grateful acknowledgments for his long and eminently valuable services, contributing largely as they have to elevate this department to its present distinguished position among the kindred institutions of our country.

"*Resolved*, That, although he now retires from the office which he has so satisfactorily and so honorably filled, we earnestly desire and hope that his life of usefulness may be prolonged for many years to come, and that we may still have the benefit of his counsel and sympathy in our cause, assuring him, that, in the future as in the past, he will be remembered as among the benefactors of our Commonwealth.

"*Resolved*, That these resolutions be entered on the records of the Board, and that a copy of the same be presented by the chairman to Mr. Flint."

The resolutions were advocated by Mr. Grinnell, who moved their adoption, and by Dr. Lynde, Mr. Ware, Mr. Moore, Mr. Hersey, Mr. Hadwen, and Mr. Slade, when they were unanimously adopted by a rising vote.

It was then voted to proceed to ballot for a secretary to fill the vacancy made by the resignation of Mr. Flint.

John E. Russell of Leicester having received a majority of the ballots, it was voted that his election be declared unanimous.

Voted, That the secretary of the Board be elected annually, at the meeting in February; the term of service to be for one year, beginning with the 1st of July following the election.

The Board then adjourned.

PUBLIC MEETING OF THE BOARD

AT SOUTHBOROUGH.

The country meeting of the Board was held at the town-hall, in Southborough, Nov. 30, and Dec. 1 and 2.

The meeting was called to order at half-past two o'clock P.M. by Capt. JOHN B. MOORE of Concord, who said, —

LADIES AND GENTLEMEN, — It becomes my duty, as chairman of the Committee of Arrangements, to call this meeting to order; and, without occupying much time, I would say to you, that the meeting was appointed to be held here in the town of Southborough, partly because it is the centre of an excellent farming population, and partly on the invitation of the Southborough people, and particularly of the Southborough Farmers' Club, — a live organization. Without saying more, I will introduce to you Dr. Joseph Burnett, president of the Southborough Farmers' Club.

ADDRESS OF WELCOME.

BY MR. JOSEPH BURNETT.

MR. CHAIRMAN, AND GENTLEMEN OF THE STATE BOARD OF AGRICULTURE, — A year ago, when you accepted the invitation of the Southborough Farmers' Club to hold this meeting here, I had not the honor of representing that club. Had I, at that time, been its chief executive officer, I should hardly have ventured to invite so large and important a body of representative men to a town so small, and having such inadequate means of entertainment.

I have no doubt the invitation was urgently given, and kindly accepted; and now, in behalf of the Southborough Farmers' Club, I bid you a hearty welcome, and, with the aid of the good people of this town, we will do what we can to make your short stay here comfortable.

By referring to your yearly reports, I find that heretofore, at your annual country meetings, your Board has been received by the resident member; and I cannot help feeling that I am somewhat out of place, and that the words of welcome should have been spoken by either Mr. Bowditch, representing the State, or Mr. Damon, representing the

Middlesex South Society. Mr. Bowditch has resisted my appeal, and insists upon thrusting all the honor on this club. Mr. Damon, who is now quite sick, and unable to be present, will, no doubt, receive from you some expression of your remembrance and sympathy.

It has been the custom at the opening of your country meetings to refer to some of the leading features and productions of the town in which the meeting is held. A small, quiet country town like this, composed mostly of farmers, can have but little to boast of as compared with Worcester or Greenfield.

Our principal agricultural products are grass, fruit, — mostly apples and pears, — milk, and pork. We have also, in the outlying villages, a few successful manufacturers of boots and shoes, and one of woollen goods.

Of apples, we, in common with our neighbors in this section of the State, have this year had a very abundant yield: it is estimated that not less than thirty thousand barrels have been packed and sent to market from this town, besides a great number of car-loads which have been sent away, and manufactured into cider, say forty-five thousand bushels. I judge that the amount of money which our farmers and towns-people will receive for their apples this year will be not less than thirty thousand dollars.

Our most important product is milk: upon that one article our farmers chiefly depend for their income. For some years past, the average number of cans sent to market has been about fifteen hundred daily, yielding in money three hundred and seventy-five dollars. For the last year, the quantity has been somewhat reduced, owing to the increased demand for butter and cream.

Pork in its various forms is another important product of the town. I am informed, on pretty good authority, that, at the present time, not less than half a ton of sausages are daily shipped from Deerfoot Farm: they are sent to a great number of towns and cities, reaching as far as Detroit and Chicago. I trust that those of you who are without scruple or prejudice against pork may have an early opportunity to test the merits of this famous commodity.

The cultivation of maize, or Indian-corn, is daily receiving more attention in this part of the State. With special

fertilizers, improved implements, and labor-saving machinery, it may be made to appear that we can produce corn of a better quality, and perhaps cheaper, than we can buy of our Western neighbors; but I know I am trespassing on ground that is to be fully and ably occupied by my friend, Dr. Sturtevant of Framingham, who is advertised to speak to you on this interesting subject.

Having referred to special fertilizers, I cannot allow this opportunity to pass without again alluding to them, and expressing my belief that the products known in the market as the Stockbridge Fertilizers are of incalculable value. Indirectly, I suppose, we are indebted to the Agricultural College, which gave to Professor Stockbridge the opportunity to experiment upon and to produce them.

If the college is fairly entitled to that credit, and if it had accomplished nothing more, I hold that the State has received ample compensation for its bounty to that institution: but it has done and is doing much more: its usefulness and its power is beginning to be felt all over this Commonwealth. What has it done for Southborough? I answer with the names of Thompson, Brewer, and Choate, honored graduates of that college: the education they have there received enables them to survey their farms, analyze their soils, construct their buildings properly, build roads, and thus be an instruction, example, and assistance to their less favored neighbors.

To your Board it is largely due that our farmers can safely, and with confidence, invest their money for fertilizers: for you have so influenced legislation, that now the law protects the buyer, and punishes the impostor. Under this safeguard the sale has rapidly increased, and is still increasing, all thanks to your Board and to Professor Stockbridge and to the State; for you have made the cultivation of our rugged soil more easy, more productive, and more profitable.

In this connection, I desire to thank the Agricultural Club of Boston, of which the Hon. Marshall P. Wilder is president, for their generous gift of one hundred dollars, to be awarded in premiums for the best collections of corn exhibited here. The splendid show which so richly adorns the walls of this hall furnishes ample material for the deliberations of your Committee of Awards.

I had hoped that President Wilder, whose fame as an agriculturist and horticulturist is as wide as the world, who labored so earnestly and so successfully to organize and build up the State Board of Agriculture, would have been present in person to receive our congratulations and our thanks.

It may be interesting to you to know that Southborough was among the first of the towns in this State to recognize the importance of breeding thorough-bred cattle. As early as 1854 a herd of imported Jerseys, consisting of three cows and a bull, was brought into this town; and from that small herd, together with a later importation in 1864, there has gone forth into all parts of the country choice specimens of that approved and popular breed.

In the year 1857 the late lamented Henry H. Peters imported a large and valuable herd of Ayrshires, which, under his skilful care and breeding, became one of the most noted herds in this country. Many of you will remember his great sale by auction, where single animals brought from four hundred to five hundred dollars, the total amounting to upwards of ten thousand dollars. From 1859 to 1863 Mr. Peters was a member of your Board, representing the Middlesex South Society. In 1859 he was the founder and first president of the Southborough Farmers' Club; and the old members of the club know how earnestly he labored to make it a useful institution. And here I wish to say, that to the enterprise, public spirit, and generosity of Mr. Peters, this town is greatly indebted. He returned from California to Boston in 1855, with ample means, and with a strong desire to be a farmer; he came to Southborough, and bought a splendid farm, well known as the Peter Fay Farm. He began at once to make improvements: he thorough-drained his wet lands, he ploughed deep, he enriched his soil judiciously, he planted trees, and he tried many experiments which the ordinary farmer could not afford to try. He reaped his reward in abundant harvests, and in the benefits which he conferred on his fellow-men. He was also deeply interested in the subject of education. The fine building in yonder valley, now occupied by the Peters High School, was a gift from him to the town, and stands a silent witness of his munificence. He not only worked early and late to carry

out his projects for public improvement, but he gave freely of his substance. He gave five hundred dollars towards building our soldiers' monument, — one-third of its entire cost; and, during his residence here of some nine years, he labored constantly to improve the minds and beautify the homes of our people. He has passed away; but the good he has done still lives, and grows stronger and brighter with each succeeding day. I need not add that his memory is embalmed in the hearts of all, the old and the young, in this community.

The Fay Library, which occupies a part of this building, is free to all. It consists of nearly five thousand volumes. It was founded and endowed by the late Francis B. Fay of Lancaster. Mr. Fay was born and bred in this town; he was jealous of her good name, and ever mindful of her best interests.

St. Mark's School, modelled after the great schools of England, was established in 1865, and is located here. It has a good record, and is now fitting fifty boys for the leading colleges of this country.

Mr. Chairman and gentlemen, I should fail in my duty if I did not, in behalf of this club, render to your Board the thanks of all its members for the great benefits we have derived from the yearly reports of your doings; and I would especially thank your late secretary, C. L. Flint, for his constant and uniform kindness. He was our old and tried friend, ever ready to answer questions, furnish information, and aid us in every way.

I cannot pay him the official tribute which he deserves at your hands; but, in his voluntary retirement from his long and arduous labors, I wish for him that happiness which must come from a sense of faithful service and from the tribute of a multitude of grateful hearts.

His successor, Mr. Russell of Leicester, is a Worcester-county man of whom we are justly proud. I believe he is well qualified to perform the duties of the office to which you have elected him. I congratulate you upon being able to secure his services, and I congratulate him on his official position, which is one of usefulness and honor; and I take pleasure in bidding him welcome to Southborough.

I will not detain you. I know that important essays are

to be read, and interesting discussions to follow, and you have your usual business to transact.

You cannot know all the good results which will come from your work here. It is like planting seed in a good soil, which grows and ripens and bears fruit long after the seed is planted. You will, I know, perform your duty as best you can; and so you will confer lasting benefits on the community, and gain renewed credit for your honorable Board.

The CHAIRMAN. I will not undertake to thank the president of the Farmers' Club for his address. That more properly belongs to the Board, who will see to that. We will now proceed to the regular business of the meeting. The first paper to be read is a paper upon "Ornamental Trees," by Mr. JOHN ROBINSON of Salem.

ORNAMENTAL TREES.

BY MR. JOHN ROBINSON.

In preparing this paper upon ornamental trees for Massachusetts plantations, it has been the endeavor of the writer to call attention to the physical conditions under which the trees best adapted to our wants are found, — a side of the question too often neglected both by the planter and the essayist. Very little need be said regarding the trees individually, excepting those which may illustrate forcibly such points as seem to require it. In order to make a proper selection of trees for ornamental or economic planting, something more is necessary than a mere fancy for the trees selected. A knowledge is required of the species which will, under peculiar conditions, endure the longest, and prove, at the end of a generation or two, that the choice was wisely made. Failing in this, disappointment must result, and others will be called upon to do again the work which a proper knowledge of the subject might have permanently accomplished at first, with no greater outlay.

The distribution of trees over the earth's surface is wholly depending upon the distribution of rainfall, and the temperature, locally varied by the condition and composition of the soil. Where there is a generous rainfall, and moderate, equable temperature, a luxuriant forest will thrive, varying,

of course, from the profuse vegetation of the tropics to the stunted forms of the polar regions and the alpine tops of high mountains. In North America a great belt of forest extends down the Pacific coast from Alaska to California, across to Newfoundland, and thence south to the Gulf of Mexico. The treeless regions are the coast of California below the thirty-fifth degree of latitude, the plains and prairies east and south-west of the Rocky Mountains, and the great arid deserts which occupy that vast region which lies south of the Blue Mountains of Oregon and between the high Sierras and the Rocky Mountains, extending far south into Mexico, and which is known as the "Great Basin." This interior dry region is caused by the westerly winds blowing from the Pacific Ocean, and the southerly and easterly winds blowing from the Gulf of Mexico, depositing their moisture on the intervening mountains, which shut it in from the influence of the ocean. This is not the time, nor will space permit us, to give even an outline of the theories which are advanced to account for the present distribution of forest-trees. For countless generations, species have been slowly adapting themselves to their fitting places. Natural selection, and the survival of the fittest forms for the position they are to occupy, have placed on the earth's surface the exact species in the exact positions best suited for their development. In different climates and in different situations the particular variety, too, of the species that can best sustain the local conditions to which it must be subjected, is found. This is illustrated very clearly by some of our own forest-trees. The most widely distributed of North-American coniferæ, and one little changed in appearance, is the red cedar (*Juniperus Virginiana*). This tree is found as far north as latitude fifty, and south to the Gulf of Mexico, extending from the Atlantic to the Pacific. At its extreme northern limit it is only a shrub; on our own sterile hills it becomes a rugged tree, and is of no little economic value for many purposes; while in the warmer climates of Florida the same species is banished to the swamps, and furnishes that clear, soft wood used the world over in the manufacture of the best lead pencils. The Douglas spruce, which is one of the most valuable of American forest-trees, has a less extended range. It is common from British Columbia to Mexico, ex-

tending east into the Rocky Mountains of Colorado. The most interesting point is this: children inherit the characteristics of their parents; and even the seeds of trees carry with them and perpetuate the constitutions, delicate or strong, that the region in which they were produced developed in the parent plants. The seeds of the Douglas spruce from the Rocky Mountains produce trees which are as hardy here in New England as the cedars on our hillsides; while plants raised from the seeds of the same tree growing in the milder, moister climate of the Pacific States, fail entirely to adapt themselves to our New-England climate, as, indeed, do all the trees, with hardly an exception, from the region west of the Rocky Mountains. Therefore, having an insufficient knowledge of the distribution of a species, we cannot say that any particular tree is hardy, and will serve our purposes as material for forest or ornamental planting; but we must know, in the case of widely distributed species, the exact physical conditions of the particular locality from which the individual was obtained.

Massachusetts herself, wonderfully rich in arborescent species, belongs botanically to the Appalachian flora, — a flora which contains a larger variety of trees than that of any region of similar extent in the north temperate zone, with the single exception of Western Asia.

The Appalachian flora, which embraces the plants of Canada and all the Northern States east of the Mississippi River, descends along the Alleghany Mountains as far as Georgia, and, in the high mountains of North Carolina, reaches, in the multiplication of tree species, its greatest development: here, in a comparatively small area, are more than twice as many species of trees as grow naturally in all the continent of Europe.

The climate of this region is, from its great altitude, not unlike that of New England; and the trees of all the Appalachian flora, and especially those of the high Southern mountains, thrive here in Massachusetts. The trees of this flora are beautiful and varied; and, if we wish to secure to our plantations a certainty of permanent success, we must turn to our own forests for our best material, and avail ourselves of the benefit of Nature's own selection.

Our New-England forests are everywhere famed for the

brilliancy of their autumnal foliage; and certainly, for several weeks, longer than any flowering tree retains its beauty of blossom, the maples, ashes, oaks, and many other trees, display a magnificence unequalled by any show of flowers. Even without considering this, our native trees are superior, for our purposes, to their too often-planted European allies.

With what has been previously shown regarding the suitability of native species to the climate in which they grow, and the unusually large number of species from which we have to draw, it seems hardly necessary to argue that we need not look far to find the region from which to select the best trees for our lawns, woods, or streets.

One of the greatest difficulties in the way of obtaining native species is the scarcity of such material in our nurseries. Most American nurseries contain at best few American trees, being chiefly filled with the more easily procured European plants, which, however attractive they may appear in their young state, are generally unsatisfactory here at maturity; European species, as a rule, having, after a test of more than fifty years, failed, in most cases, to make fine trees suitable to our climate, or in any way equal to their American relatives. This error in selection renders it too often desirable to replant many of the older estates in the neighborhood of Boston; and it is a source of general regret, that, when Central Park in New York was commenced, few other than common European trees could be procured in the nurseries to plant there. The visitors to this great pleasure-ground are therefore prevented from becoming familiar with the beautiful trees of our own forests.

Comparing the allied trees of the American and European forests, it will be found, that, when such comparison can be fairly made, the advantage for our purposes is invariably in favor of the American tree.

The white pine (*Pinus Strobus*), while it is for practical purposes the most valuable of the New-England pines, is at the same time much more beautiful than any pine capable of withstanding the rigor of our climate. The European Scotch pine (*Pinus sylvestris*) and the Austrian pine (*Pinus Laricio* var. *Austriaca*) are frequently planted, although they have already proved themselves unable to attain maturity in our climate.

The red or Norway pine (*Pinus resinosa*), — very seldom seen in cultivation, although common in the wild state farther north, — while resembling somewhat the Austrian pine in appearance, is its superior here in beauty, usefulness, and duration of life; and even our pitch-pine (*Pinus rigida*) is in some localities a very attractive and useful tree, which can be planted with considerable profit on sandy and exposed barrens, like some portions of Cape Cod. The Norway spruce (*Picea excelsa*), perhaps more extensively planted than any other tree as an ornamental evergreen, does not fulfil in this country the promise of its earlier growth. At first the trees make rapid headway, and are of a dense habit, which, in favorable localities, is retained for a good many years; but, long before they reach maturity, they more generally become bare in appearance, and in no way equal to the white spruce (*Picea alba*) of Northern New England, which for ornamental planting, for wind-breaks, or hedges, should always be preferred. The native white ash (*Fraxinus Americana*) cannot be equalled here, either in beauty or utility, by any other of the family, and must not become superseded by the European ash (*Fraxinus excelsa*). Of the lindens, the American (*Tilia Americana*) is for us a finer tree than the European (*Tilia Europæa*), the fragrant blossoms of which are its recommendation to special favor; and the Southern linden (*Tilia heterophylla*), not yet introduced into cultivation, may prove a valuable accession in this vicinity. For New-England plantations no foreign maple can compare with the sugar-maple (*Acer saccharinum*) or even the scarlet maple (*Acer rubrum*). If the beautiful autumnal tints of the American maples were the only points in their favor, this would be sufficient reason for their retention in place of the foreign species; for they are in their greatest beauty at a season when all else is dull and sombre.

The European maples most frequently planted in Eastern New England are the sycamore-maple (*Acer Pseudo-Platanus*) and the Norway maple (*Acer platanoides*). The former proves of little value for ornamental or economic purposes; but the latter, when planted in vicinity of the ocean, makes a fine tree, and flourishes as well, perhaps, as any native species. In the interior the foliage of this tree often becomes brown as the season advances; and the trees are subject during

periods of drought to the disfiguring attacks of the red spider. The Norway maple, however, surpasses in the beauty of its abundant flowers all American maples. The only European oak much planted here is the English oak (*Quercus robur*), a near relative of our white oak (*Quercus alba*), but for us inferior to it in every way. The English oaks which grow here look, at their best, but poor and cramped compared with the American species; nor do they promise to ever attain in this country the great age for which in Europe they are famous: indeed, the life of an English oak here in New England rarely exceeds fifty years.

In addition to the white oak we have, at least, ten other species to select from, all differing in foliage and habit sufficiently to satisfy the most capricious arboriculturist. Of the oaks not found in our own immediate region, the overcup-oak (*Quercus macrocarpa*), or, as it is in some places called, the burr-oak, the pin-oak (*Quercus palustris*), and others growing in adjacent States, are perfectly hardy, and should be more extensively planted. The burr-oak is more valuable, perhaps, than our white oak for certain mechanical purposes, as the wood in the ground resists decay longer, probably, than that of any American species.

Comparisons might be continued between American and European trees. We might compare the walnuts and beeches of the Old and New World, and arrrive at the same conclusions, or the American chestnut with its European representative; but it is hardly necessary to extend these comparisons further.

The examples already given will direct attention to the fact, that, while there is at hand a supply of trees in every way better adapted for plantations in New England, the European species most nearly related to them are far too generally planted in their stead. Our nurserymen should pay more attention to this subject, and produce a supply of trees better adapted to the needs of the climate and soil; for, after all, it is to the nurseries that the majority of persons must resort for the plants they need; and the want of knowledge on the part of most buyers prevents them from making a judicious selection for their plantations. It is therefore important that the proprietors of nurseries should be persons of wide information, and scrupulously careful in

their dealings. Until very recently the American nurseries contained few or none of the trees of the Alleghany region just spoken of, and therefore these are too seldom seen in cultivation.

Of the more common New-England species not previously mentioned, we have the hickories, sturdy clean trees, with, in many cases, a desirable fruit and valuable timber; the elms, of which the white elm (*Ulmus Americana*), in a moist rich soil, arrives at a majestic maturity unsurpassed by any of our trees; the birches, some of which (the most beautiful) are not so long lived as could be desired; the cherries; the sassafras; the tupelo (*Nyssa multiflora*), a tree not half appreciated with its glossy summer foliage and brilliant autumn tints; the hornbeams; and, of the lower-growing species, the witch-hazel (*Hamamelis Virginiana*), with its flowers in November conspicuous as being developed after the leaves have fallen; the elders; hawthorns, of several varieties, with fine large blossoms and brilliant fruit; the sumachs; the viburnums, many of which are of remarkable beauty; and the dogwoods, seldom cultivated to any extent, yet containing among them the *Cornus florida*, one of the most desirable of small trees, which gives beautiful and conspicuous flowers, bright-red fruit, and brilliant autumn foliage. In the heath family (*Ericaceæ*) are the kalmia, cletha, rhododendron, azalea, and a host of shrubby species, which are often re-imported from European nurseries, where they are known as the "American plants." All these are perfectly hardy, and no trial is necessary to assure us of the fact. Besides these, we may add from the Alleghanies — that great storehouse from which, as has been already pointed out, we can draw so varied and so valuable additions — the cucumber-tree (*Magnolia acuminata*) and a number of lower-growing members of the same genus; the box-elder (*Negundo aceroides*); the locusts; the honey-locust (*Gleditschia triacanthos*); and the fringe-tree (*Chiananthus Virginica*), with which we are already familiar; the yellow-wood (*Cladrastis tinctoria*), often called virgilia; the red-bud (*Cercis Canadensis*); the sorrel-tree (*Oxydendrum arboreum*); the Buckeyes; the Kentucky coffee-tree (*Gymnocladus Canadensis*); the persimmon (*Diospyros Virginiana*), whose edible fruit will ripen perfectly well in the New-England climate; the black walnut

(*Juglans nigra*), now becoming so scarce, that, on the ground alone of the value of its wood, it should be more extensively planted, as should the butternut (*Juglans cinerea*) from our own region, which is capable of making a fine shade tree, and producing a most valuable wood for the cabinet-maker. The Western catalpa, but recently distinguished from the Southern species, which has long been cultivated here, besides bearing very beautiful and conspicuous flowers, is probably one of the most valuable of our timber trees, the wood resisting decay to a very remarkable extent. Enough has been said already to show that American are, for our purposes, generally superior to foreign trees; but there are foreign trees too, which, for certain situations, possess advantages over any of their American relatives. The European larch is a better timber tree in New England than the closely allied American species. It is possible, too, that trees of wide geographical range have a more elastic constitution and greater power of adaptability to the different conditions of life, and are thus better able to support changes of climate and soil. Such a case is that of the English elm (*Ulmus campestris*), which generally thrives in the city streets of Eastern New England, withstanding the drought and smoke better than the allied American elm, which only reaches its greatest perfection in alluvial river meadows or in most springy soil. The same might be said of the white willow (*Salix alba*), which is one of the most common of all introduced trees. This tree and the English elm have naturally very extended geographical ranges, the elm extending through Europe and Siberia to the Pacific; while the willow is found growing in the Old World over the greater portion of the north temperate zone. Of foreign trees, too, the ailanthus, often unnecessarily discarded on account of the odor of its male flowers, will produce better wood, it is said, on poorer soil, and in more exposed situations, than any other tree which can be grown in our climate. The ailanthus is a native of the northern provinces of China, a region from which we are led to expect most excellent additions to our list of ornamental and useful trees. For all economic planting in New England, native trees are, with these few exceptions, the best; but, for those who intend making extensive ornamental plantations, it will be desirable to add

variety to their collections of native trees by the introduction of exotic species; and the question naturally arises, Where are we to look for such additions? Great and expensive mistakes have been made in the past by neglecting to study the conditions under which any exotic species flourishes naturally. Many attempts have been made, and much money wasted in the struggle, to acclimate in the East the trees of the Pacific forest, and always with the same result, — a total failure.

The great black current of the Pacific Ocean produces a climate for Oregon similar to that of Ireland and England, and very unlike our own. So, as might have been expected, the trees of the Pacific forest, which fail entirely in Eastern America, succeed perfectly in Western Europe, where, of late years, they have been largely introduced. Had the conditions under which these trees grew been carefully observed, and a practical application made of the result, no such attempt would have been made to cultivate them in a climate like ours, excepting in those experimental gardens, which, if arboriculture is ever to attain the dignity of an exact science, must always be kept up in every country, either through private enterprise and interest, or in public institutions endowed for the purpose of such special research. Where, then, shall we go in search of additional species? As the corresponding coasts of continents are found to possess similar floras, it is natural to expect that the best results would be obtained for us from plants taken from the region of Mantchuria, Northern China, and Northern Japan. Indeed, we find that there are many indigenous species common to the seacoast floras of both continents. Among such are the mountain maple (*Acer spicatum*), the speckled alder (*Alnus incana*), a hemlock quite nearly like our own Eastern hemlock, and a white birch: there are barberries, species of rhus, the fox-grape (*Vitis Labrusca*), spiræas, and a large number of woody and herbaceous plants common to both floras. It is important to consider the latitude in which the Asiatic plants naturally grow. It is, of course, as useless to expect that a plant from South-eastern Asia should flourish in the latitude of New England, as that one from our own Southern States should find itself at home on Mount Washington. But the plants from the southern coast of China and Japan will thrive

in our South-eastern Atlantic States. The camellia has already become spontaneous in some parts of South Carolina; and the pride-of-China (*Melia Azederach*) has thoroughly established itself in nearly all the Southern States; while the ailanthus is gradually gaining a foothold throughout the Middle States and the South.

So far as experiments go, it is proved that the region of Eastern Asia is the one, and only one, to which we are to look for any further extensive additions to our plantation. For years our gardens have been enriched by a host of plants from China and Japan. The Chinese wistaria, more elegant than our native species, and the early-flowering magnolias, have already found their way into almost every garden; the wigelia and the deutzia are hardly less common; while the Chinese honeysuckle flourishes here in cultivation more vigorously than any native species.

The Chinese tamarix, a larger and better tree than the European species most frequently seen in cultivation, has proved during thirty years perfectly hardy; the akebia, with its curious dark-purple blossoms, has long been a favorite ornament in gardens; and the Japanese woodbine has certainly met with the welcome it deserves.

Most of the plants thus far mentioned are quite familiar, and flourish in nearly every garden, in company with the dicentra, Japanese lilies, peonies, and roses. The guiko-tree (*Salisburia adiantiflora*) has been long enough in cultivation to be satisfactorily tested for our region. This singular conifer produces a fruit containing a seed the size of an almond, which the Japanese consider a great delicacy, and which would readily find a sale in our markets. Several of these trees which have reached maturity in this country have already perfected fruit, among them one at Central Park in New York.

Various other trees from Eastern Asia may be found in botanical gardens and in the grounds of those who have been fortunate and wise enough to obtain them. Nearly all such give promise of success, and, when they become more easily attainable, are likely to be extensively planted, as they deserve. Many of these are evergreen conifers from Japan, and include the umbrella-pine (*Sciadopetis verticillata*): a larch (*Larix leptolepis*) of great beauty and rapid growth;

the beautiful hemlock (*Tsuga Japonica*); several spruces and pines, two of which (*P. parviflora* and *P. Koriensis*) are nearly related to our white pine: another (*P. densiflora*) is occasionally met with in cultivation, where it is wrongly called *P. Massoniana*, the name belonging to a species from Southern China, which, although probably hardy in our Southern States, could not be expected to thrive here in New England. Then there are the retinosporas, closely allied to our white cedar, of which there is an endless variety, many being quite dwarf, and possessing great beauty of foliage and form; and the juniper (*J. Sinensis*), which has a compact habit, and is of a fine blue-green color. Of Japanese shrubs which are likely to become common in our gardens as they are better known, are *Azalia mollis*, perhaps the most beautiful of all flowering shrubs; the single kerria; the rhodotypus; several spiræas; the plums; several species of rose; and, perhaps most desirable of all, the *Viburnum plicatum*, with flowers which resemble, but far surpass, the old-fashioned snowball. Among the trees there is the chestnut too, which seems to be hardly more than a variety of the Old-World species; the walnut (*Juglas Sieboldii*), nearly related to our butternut; and many others. From Mantchuria has come a walnut bearing its fruit in clusters more than a foot in length; a maple with deliciously fragrant blossoms; plums; an elder; an elm which hardly has a superior in beauty among exotic trees; the *Cladrastis Amurensis*, nearly related to the yellow-wood of the Kentucky forests; several barberries; and another very desirable tree, the *Phellodendron Amurense*, which belongs to the family of sumachs, and is now fairly tested in the New-England climate. From Northern China we have a birch; a maple; the flowering apples; a hawthorn; the white-barked pine (*P. Bungeana*), the common coniferous tree of that region; *Prunus Mume; Cedrella Sinensis*, a near relative of the ailanthus, with fragrant yellow blossoms, and a wood valuable for cabinet-work; the hawthorn-leaved raspberry; the exorchorda, a little-known but very beautiful plant; the idesia, a tree interesting to botanists as being the only representative of its family (the *Buxineæ*) that we may hope to cultivate successfully, and which is already in cultivation in Massachusetts, where it promises well. There are still other trees from the same

region, which will no doubt prove perfectly hardy: among such are the Mantchurian linden, several maples, oaks, and magnolias, an ash, and two spruces. It should not be forgotten that from Southern Japan and China many species not hardy at the north may be introduced to our South-Atlantic coast, where the *Paulonia imperialis*, a tree valuable both ornamentally and on account of its excellent timber, already flourishes, even resisting the winter as far north as Providence, R.I.

The Chinese and Japanese have cultivated flowers and trees longer than any other people: they are, particularly the Japanese, ardent lovers of nature, and possessed of strong æsthetic tastes. It is not surprising, therefore, that their gardens are filled with rare and beautiful specimens of plants, and that all varieties that are interesting should have been carefully preserved. From these gardens we have already received many fine plants, especially the numerous dwarfed evergreens and the varieties of the beautiful Japan maples. Although Eastern Asia is the only region from which any extensive additions to our forest flora may be expected, yet there are other regions, of restricted limits, where we may still find many species for cultivation in New England.

From the region of the Caucasus we obtain two of the best spruces (*Abies Nordmaniana* and *Picea orientalis*), and the beautiful and perfectly hardy *Pterocarya fraxinæfolia*, a curious Old-World ally of our New-England hickories.

Success may be expected with plants from Turkestan, and it is possible that certain local influences may, in other parts of the world, produce, in limited regions, a climate not unlike our own, whence we may obtain a few additions to our collections. Such a region may possibly be found among the Himalayas or Thibet.

It has but recently been discovered that the horse-chestnut is a native of the Balkan Mountains, it having been introduced into Europe, by the way of Constantinople, in 1615, whence it came to America. As might be expected, the tree flourishes here fairly, doing better in cooler situations, near the water, than when it is exposed to the hot sun and droughts of the interior towns, where the foliage often becomes brown and disfigured.

As has already been stated, the Douglas fir, when raised from seed collected in the Rocky Mountains, is here in New England perfectly hardy. This fact indicates another region to which we may look for additions to the list of American trees valuable for New-England planting. From these high interior mountains, the flora of which is indeed remarkably poor in arborescent species, we have obtained fully half a dozen trees which promise the most excellent results even in our climate, — a result not, perhaps, very surprising, as many eastern species reach these mountains, there finding their western limit, and thriving side by side with some of the peculiar forms of the Pacific forests, thus proving a certain slight analogy between the climate of New England and that of the south Rocky Mountains.

Of these Rocky-Mountain trees, two deserve particular notice. The blue Rocky-Mountain spruce (*Picea pungens*) is a tree of rapid growth, great hardiness, and of a peculiarly charming blue-green color. This tree has been widely tested in Eastern Massachusetts during the last eighteen years, and specimens nearly fifteen feet high may now be seen there of unsurpassed beauty. This tree is perfectly hardy in the most exposed situations, and grows with great rapidity. It is, in its young state, remarkably compact in habit, and will form, it is confidently expected, a valuable hedge-plant. The second of the Colorado trees to which your attention is called is the Douglas fir already mentioned. This tree, — both as a subject for ornamental planting, and in its home, the West, — as a timber tree, is perhaps unequalled by any coniferous tree. The trees first raised here from Colorado seeds are perhaps fifteen feet high, and show by their vigorous and rapid growth an indication that the species can adapt itself to our climate and soil. The Douglas fir is the most interesting and valuable of all exotic trees recently introduced into Massachusetts; and, should it be found in the future that it is capable of producing here as valuable timber as that yielded by this tree in its native habitat, its introduction will be worth many millions of dollars to the State.

For more than a hundred and fifty years public-spirited citizens have been experimenting with exotic trees in different parts of the country; and, if we know now what trees to plant and what to avoid, it is because such experiments have

been and are being made. But science is long, and human life is short, too short to successfully undertake experiments which, to be truly conclusive, must often extend through generations of human life.

Such work will be more systematically, and therefore more satisfactorily, performed in public institutions, which may be expected to continue certain lines of research from generation to generation, and where the duration of experiments will not depend on the pleasure or on the life of the individual man.

The country is to be congratulated, that, in pursuance of this object, and others relating to arboriculture, Harvard University has established the Arnold Arboretum, which contains some hundred and twenty-eight acres of land, quite variable in character, a portion of the well-known Bussey Farm in Roxbury, near Boston. The location is such, that the results of experiments there made will be of special value to New England, and of general interest to a large portion of the whole country. The arboretum is yet in its infancy, having been commenced only in 1874; so that, excepting the older trees, of which there are many already upon the estate, the majority of species are hardly more than nursery specimens, which, pending certain arrangements between the arboretum and the city of Boston, have not as yet been planted in their proper places. The work of the arboretum is therefore largely in the future. It is proposed, as soon as possible, to plant out along the main roadway the various orders of trees and shrubs in botanical sequence, both native species and those of foreign introduction, including all their varieties; so that any one not possessing a special botanical knowledge may at a glance comprehend the classification, and see by direct comparison the plants which best endure our climate. Among the many plants cultivated, of course, some will prove failures; and it is part of the work of the arboretum to show by living illustrations what to avoid, as well as what to select.

In fact it is intended to make the arboretum a living museum, to which the nurseryman, the gardener, and the private land-owner may resort for trustworthy information regarding all trees and shrubs, and save themselves the cost of personal experiments and the delays caused by an unfor-

tunate selection. The collection of living plants at the arboretum is already richer in species than any other American collection, and is continually being increased by a system of exchanges with similar institutions in other parts of the world. Here, too, experiments are made with the seeds of plants taken from widely different localities, with the hope, as has already been shown in the case of the Douglas fir, that additions may be made to our list of hardy trees, not through what is known as acclimatization, but by using seeds procured from individual plants growing naturally under conditions as near like those of New England as can be found. Many interesting facts have already been obtained regarding the adaptability of plants to our climate.

Besides the collection of living plants, there has been established an herbarium, to be used as a reference collection for students and others in determining the names of species, or for comparison of plants from different localities. It is intended that this collection shall contain abundant specimens of every woody plant of the temperate zone, and all others that may be necessary to illustrate more fully any special family or group of plants. There has also been commenced a collection of tree products, which include the wood in its natural state with the bark, any interesting or valuable varieties, cones, nuts, and fruit generally of the trees, and any thing in the way of raw material which they may produce.

The collections of the arboretum are already assuming very considerable importance; and its museum, in connection with the living plants, will offer the student of trees, whether he wishes to study them in their scientific, their ornamental, or their economic aspects, facilities such as this country has not before offered.

In view, at no distant day, of the scarcity of forest-trees, it is well to plant for ornament those trees which, other things being equal, will be of the greatest economic value. Thus of the ashes, the white ash should be planted in preference to the red ash or green ash; the sugar-maple should be planted in preference to the white maple, the wood of which is inferior for all purposes; of the oaks, the burr-oak and white oak are either much superior to black oaks; and the red or Norway pine, previously spoken of as one of our most

desirable forest-trees, should be planted rather than the more common pitch-pine.

In economic planting, too, it is well to remember that the most valuable trees are already scarce, or likely soon to be so; and that, by planting now such trees as black walnut, butternut, white pine, white ash, the hickories, etc., a certain profit will be made in the future.

It would not be proper, in treating of the general subject of natural planting, to pass by in silence, and without a protest, the pernicious and wasteful custom—an outgrowth of the bedding-out fashion in gardens—by which all sorts of variegated leaves or other abnormal forms of plants are given the first consideration. Nature is very indulgent, and permits the horticulturist to mould and shape her works into various forms. The perpetuation of these monstrosities and vagaries is no credit to those who pander to the false taste which encourages such productions, nor is it any credit to those who waste their time and money in planting these sickly evanescent forms where the healthy plant in its natural condition is every way preferable. Of course there must always be exceptions, and Nature has, in making a change of color, sometimes given us valuable contrasts, as in the case with the purple beech; but even the purple beech cannot be planted indiscriminately.

We have a long line of golden oaks, golden ashes, golden lindens, striped-leaved, silver-leaved, or golden-banded varieties, hideous to any lover of nature. Looking upon these sickly plants, each seems, by turn, more ugly than its neighbor. All should be sent to the rubbish-heap together, and permanent natural productions planted in their places. These plants are all the result of some constitutional weakness, an impeded or irregular distribution of juices of the plant, and, like all other abnormal forms, cannot be long-lived. The only thing that can be said in their favor is, that they will die naturally in a short time. Nor can much be said of that class of horticultural productions known as weeping trees. In a few cases beautiful and interesting, they have become absurd through their too frequent employment.

It is impossible, in the hour allotted for this paper, to more than outline the general spirit which should govern us in the selection of ornamental trees. Only a few examples are used

in illustrating the sections into which the subject naturally divides itself, and hardly any thing can be said regarding the merits of particular species for the multitude of locally varied situations which will continually require attention and special study as the subject comes more into prominence.

It is only necessary, in conclusion, to call attention to the principal points which it has been the effort of this paper to present to your consideration: —

I. That, for planting in New England, our own New-England trees are, with few exceptions, the best.

II. That, in addition to the New-England trees, we can safely make use of the many beautiful and useful trees which abound in the forests of the Middle States and the Alleghany Mountains; and that to these Eastern species may be joined a few trees of unsurpassed beauty in the Rocky-Mountain region.

III. For exotic species with which to add variety and interest to a plantation, we must look to Eastern Asia rather than to Western Europe.

APPENDIX.

List of trees rarely cultivated in Massachusetts, and which should be more generally introduced. Such species as have not been thoroughly tested, but which, judging from the region in which they naturally grow, may be expected to succeed here, are marked by an asterisk.

NORTH AMERICAN.

Appalachian, other than Natives of Massachusetts, etc.

Magnolia acuminata. (Cucumber-tree.)
Magnolia cordata.
Magnolia Fraseri.
Magnolia macrophylla.
Magnolia Umbrella. (Umbrella-tree.)
*Tilia heterophylla.
Æsculus flava. (Sweet Buckeye.)
Æsculus glabra. (Ohio Buckeye.)
Cladrastis tinctoria. (Virgilia. Yellow-wood.)
Gymnocladus Canadensis. (Kentucky coffee-tree.)
Cercis Canadensis. (Red-bud. Judas-tree.)
Pirus coronaria. (American crab-apple.)
Cratægus cordata. (Washington thorn.)

Cratægus subvillosa. (Valley of the Mississippi.)
Liquidambar Styraciflua. (Liquidambar.)
Viburnum prunifolium.
Oxydendrum arboreum. (Sorel-tree.)
Diospyros Virginiana. (Persimmon.)
Halesia tetraptera. (Silver-bell tree.)
Fraxinus quadrangulata. (From Michigan, etc.)
Chionanthus Virginica. (Fringe-tree.)
Catalpa speciosa. (Western catalpa. Valley of the Mississippi River.)
*Ulmus alata. (Whahoo. Winged elm.)
Ulmus racemosa. (American cork-elm. Western States.)
Juglans nigra. (Black walnut.)
Carya sulcata. (Western shellbark-hickory.)
*Quercus heterophylla. (New Jersey, Delaware, etc.)
Quercus imbricaria. (Shingle-oak.)
Quercus macrocarpa. (Burr-oak. Overcup-oak.)
Quercus palustris. (Pin-oak.)
Quercus Phellos. (Willow-oak.)
Castanea pumila. (Chinquapin.)
Taxodium distichum. (Bald cypress.)
Picea alba. (White spruce. Northern America.)
Pinus Banksiana. (Gray pine. Northern America.)
Pinus pungens. (Table-mountain pine.)

From the Rocky Mountain Region.

Cratægus rivularis. (Interior mountain region between Rocky and Cascade Mountains.)
Populus angustifolia.
Abies concolor. (White fir.)
*Abies subalpina.
Pseudotsuga Douglasii. (Douglas spruce.)
Picea Engelmanni.
Picea pungens. (Blue spruce. Abies Menziesii of Colorado.)
*Larix occidentalis. (Northern Rocky Mountains and interior mountain region.)
*Pinus contorta, var. Murrayana.
Pinus flexilis.
Pinus ponderosa.

Exceptional Species from the Pacific Slope.

Rhamnus Purshiana. (Bear-berry.)
Acer circinatum. (Vine-maple.)
*Cratægus Douglasii.
*Pirus rivularis. (Oregon crab-apple.)
*Populus tricocarpa.
*Abies nobilis.
*Picea Sitchensis.

FOREIGN.

Japan.

Acer cratægifolium.
*Acer micranthum.
Acer polymorphum.
Acer rubinerve.
Acer Japonicum.
Negundo cassifolium.
*Phellodendron Japonicum.
Sophora Japonica.
Pirus Ringo.
*Pirus tomentosa.
Kœlreuteria Japonica.
*Zelkowa acuminata.
Idesia polycarpa.
*Fraxinus longicuspis.
*Platycarpa strobilacea.
Juglans Sieboldii.
*Quercus glabra.
Castanea Japonica.
*Betula Bhojhaltra.
*Betula coryrifolia.
Alnus Japonica.
Salisburia adiantifolia. (Ginkgo-tree.)
*Pinus densiflora. (Cultivated as Pinus Massoniana.)
Pinus parviflora.
Pinus Koriensis.
Sciadopetis verticillata. (Umbrella-pine.)
Tsuga Japonica.
Picea Alcoquiana.
Picea polita.
Chamæcyparis (Retinospora) filifera.
Chamæcyparis (Retinospora) obtusa.
Chamæcyparis (Retinospora) pisifera.
Chamæcyparis (Retinospora, garden varieties).
Larix leptolepis.

China and Mantchuria.

Magnolia conspicua.
Magnolia stellata.
Magnolia (garden hybrids and varieties).
Liriodendron. (An undescribed species from Northern China.)
Phellodendron Amurense.
Tamarix Chinensis.
*Tilia Mantchurica.
*Æsculus Chinensis.
*Acer Mono

Acer Tartaricum.
Acer Tartaricum, var. Ginnala. (Fragrant maple.)
Cladrastis Amurensis.
Gleditschia ferox.
*Gymnocladus Chinensis.
Cratægus orientalis.
Prunus Maacii.
*Prunus Mume.
Cedrella Sinensis.
Halimodendron argentium.
*Fraxinus Mantchurica.
*Pterocarya stenoptera.
*Quercus Mongolica.
*Betula Ermani.
*Betula Ulmifolia.
Juglans Mantchurica.
Taxodium (Glyptostrobus) Sinensis.
Pinus Bungeana.
Pinus Mantchurica
Juniperus Chinensis.
Pseudolarix Kæmpferi.

Siberia.

Caragana arborescens.
Ulmus pumila.
Picea obovata.

Turkestan.

Fraxinus potamophila.

Thibet.

*Pinus Gerardiana.

Caucasus

Acer lætum.
Zelkowa crenata.
Pterocarya fraxinæfolia.
Carpinus Duanensis.
Picea orientalis.
Abies Nordmaniana.
Abies Cilicica.

Europe.

Acer campestre.
Tilia argentea.
*Tilia dasystylis.
Fraxinus ornus.
Quercus Cerris.
*Quercus Panonica.

Carpinus Betulus.

Salix laurifolia.

Thuja Warriana. A garden variety of the North-American *Thuja occidentalis*, of English origin; known in the United States as "Siberian arborvitæ," and much hardier and in every way superior to the type.

The CHAIRMAN. The subject of ornamental trees is now open for discussion. We shall be happy to hear from any person who desires to speak. I see Mr. J. W. MANNING of Reading here. He is a man who is conversant with trees. Will he give us his views?

Mr. J. W. MANNING (of Reading). I have had something to do with ornamental trees. So far as my sale of shade-trees is concerned, there is more call, and has been for the last ten years, for the American rock-maple than for all other shade-trees combined. The Norway maple, a European tree, is inferior, I think, to the rock-maple, in hardihood, beauty, and vigor of growth. I have something to say, also, in favor of bass-wood, or American linden. I think it is adapted to almost all soils or conditions in which shade-trees are supposed to grow. I know it will grow at least half way across the continent. I have seen it in the Rocky Mountains, and I have seen it in Prince Edward's Island, and in our Eastern States. As far as I have travelled, it seems to be adapted to almost all soils.

In the matter of evergreens, our hemlock (specimens of it are here before us) is a splendid tree for a hedge. It will prune well, and may be seen in hedges almost anywhere. I should plant it in a soil that was somewhat sheltered from severe winds. We call it a hardy tree, and, if it is well pruned, it seldom or never winter-kills. In some localities I have seen it injured by winter weather and the cold March winds. The best season for transplanting trees is in the spring, about the time when the bud is swelling. I should say that would be the very nick of time; but it cannot always be done then. I do not hesitate to plant evergreens as soon as the frost is out of the ground, and continue to plant them up to June; but the idea of deferring the planting of evergreens until into June is a mistake. If you wait until that time, it is often very dry; and planting them then is apt to be fatal to them.

The CHAIRMAN. I see Mr. HYDE of Newton. He has had a great deal of experience, and can say something to us.

Hon. J. F. C. Hyde (of Newton). Mr. Chairman, I did not come here to speak, but to listen. Some people are good speakers, and others are good listeners: I meant to belong to the latter class to-day. This is, however, a subject in which I feel a great deal of interest, because, from my earliest years, I have been familiar with nurseries, and have been a nurseryman for a great many years. I have been much interested in the paper read, but shall not attempt to add any thing in the line of its remark, because the ground has been so fully covered by our friend who has given it to us. There are, however, a few things I will say.

For years I have been in favor, as some of you know, of planting barren lands with native trees. Many of you have read, probably, Mr. Marsh's book, who has given a great deal of attention to this subject, as to the effect of removing trees on the climate, on the weather, on rivers, streams, and wells: and many persons "Pooh, pooh!" at such statements; but, if they will study the subject, I think they will agree that great changes have been brought about by the cutting-off of the forests. This is certain, that the rivers and mill privileges are not what they used to be. The mills used to run without the aid of steam; but to-day the small rivers have become brooks, the larger rivers small rivers, and all who manufacture must use steam. Some say, in answer to that, that the rain-fall for the last ten years has been as large as it ever was for that period of time; but, suppose it to be so, the water now falls upon these denuded hills where before were forests, and the water was weeks working its way down, and supplying the streams more gradually than now. At the present time, the rain falls and rushes down these hillsides to the river, and from the river to the sea; and consequently it is soon gone, and the result is seen in the streams, in the springs, and in the wells.

I do not know how you find it at your homes; but I find that to-day more than half the wells are dry, and I know of farmers who have been carting water for months for their farm necessities. It was not so in my boyhood, years ago. There was a noted spring on a hillside in Newton, from which the meadow took its name, — Spring Meadow, — that to-day is as dry as the floor of this hall; and yet it was never known to be dry, summer or winter, during the early years

of my mother's life, and up to the time of her death. You can, no doubt, call to mind similar changes that have taken place. It was the object of our forefathers to "clear up" the land, and they did clear it up with a vengeance. If you will drive through New England, or up toward Canada, you will see acres and acres of land that to-day is not worth tilling, — such land as a goat would starve upon, — from which have been stripped magnificent pine-forests. Along the Connecticut River, and in the country through which it flows, you can see great pine-trees decaying where the land has been burned over, and that is called "clearing the land." The same is true of other localities.

The forests have been cut off of Cape Cod. Sometimes I have seen, where the wind has blown the sand out, the stumps from which trees were cut, I do not know but in the days of the Pilgrim fathers. Out towards Springfield, also, you will see where the forests have been stripped off; and to-day, in many instances, the land is almost barren. Some of you will remember that Major Phinney of Barnstable, and others, have covered some of these barren spots with pitch-pine seeds (although I prefer white pine for that purpose); and to-day there is a soil formed there, as there will be always where the trees grow, and the leaves fall and decay. There are thousands and thousands of acres in New England which had better be put to forest growth than to any thing else.

What can you do with this land now you have got it cleared, and which is almost worthless? It can be again clothed with forests. It is easy to do it, and for this purpose I would use the white pine. I believe it to be one of the most valuable trees. It is a rapid grower. It is a beautiful tree, and makes excellent timber and excellent wood. I have sold a growth of standing pine-wood forty years old (for I am something of an auctioneer) for a hundred dollars an acre. Now that would pay well upon some of these barren lands.

QUESTION. How are these pines to be planted?

Mr. HYDE. It may be done quite readily. Plough and cultivate your land, and sow the pine-seed. It grows vigorously. I could tell you, if I had time, of magnificent white-pine growths that have been raised from seeds, that are a delight to look upon. They must be thinned out and

pruned, so that, in time, you will have just trees enough to occupy the ground; and they will grow forty, or fifty, or a hundred feet high. Another tree, which is a suitable one for such planting, is the white birch, — a tree that, for certain localities, it seems to me, is not sufficiently appreciated. I remember a white-birch growth of some twenty acres, from which I have sold the wood twice within twenty years, which paid well.

QUESTION. What will that bring a cord in Newton?

Mr. HYDE. It will bring in Newton five dollars a cord, cut and carted.

QUESTION. How many cords to an acre were there in twenty years?

Mr. HYDE. From twelve to fifteen. In some instances I have known it to run as high as eighteen.

QUESTION. One of my friends here wants to know if you mean the gray birch, or white birch.

Mr. HYDE. I mean the white birch, that grows from twenty-five to thirty feet high in about fifteen or sixteen years.

Mr. ——. One of my old neighbors says there are not more than eighteen of these trees in Southborough.

Mr. HYDE. Well, there ought to be more, if there is any poor land here. I want to have you distinguish as to the right kind of birch. There is what is called "canoe" or "river birch:" that does not grow very well in this part of Massachusetts. In fact, I doubt if it grows anywhere in Massachusetts. Does it?

Mr. ROBINSON. Not extensively, sir. It grows in Connecticut. What we call "white birch" is called "gray birch" in various parts of the State.

QUESTION. How large will it grow?

Mr. HYDE. I have seen it five or seven inches in diameter, and from twenty-five to thirty feet high. But I have heard it said it is poor wood. I will tell you how it will turn out poor. Cut it down, cord it, and leave it out-doors. Then, if it is not poor enough, I will lose my guess. But that is not the right way to proceed. You should cut your wood, split it, and then house it. I used only white birch for fuel for several years, and it was very satisfactory. I have seen these trees grow until they have produced fifteen or

twenty cords of wood to the acre, and it requires a good growth of wood to produce that; but a dozen birch-trees will grow where only one oak would grow. There is no difficulty in planting birch-trees. They sow their own seeds, — the birds carry them. As proof of this, I might refer to a gravel-bed near Charles River, in Needham, from which the gravel came with which the Back Bay was filled, and which was dug down twenty or thirty feet. You would not have supposed there was a seed left there; yet to-day there is quite a good growth of wood in that place. White birch and pine will grow in just such gravel and sand as that, and they will soon form a soil there, as their leaves fall and decay: so that soon you will have considerable soil where there was none before. For general use and street-planting I think a good deal of the sugar-maple, although it is a little too set and prim to be graceful. I believe, also, in the Norway maple. It is a fine tree. It does not fade in the fall so beautifully as some of our trees, — as the white maple or sugar-maple, for instance, — but it is a fine tree. It has a magnificent dense foliage that you find on no other maple. I think it has a dense, heavy, massive, magnificent, green foliage. Is that not so, Mr. Manning?

Mr. Manning. Yes, sir.

Mr. Hyde. I think it ought to be cultivated more. A word about the American elm. This is a magnificent tree; but it is subject to one drawback, and that is the canker-worm in localities where the canker-worm is found. You would be astonished to see how soon you can grow an elm. I used to grow elm-trees by thousands in the nursery. You can plant the seed, and in two years have trees four feet high. If you want to see beautiful trees, go up through this region of country, through Lancaster, and see the fine elm-trees which are there to be found. The elm-tree lives to a great age. I know it may be said, "What, plant an elm-seed! Do you expect to see any of the trees?" Yes, I do; but, if I do not, somebody else will. The trees which have grown from the elm-seed I have planted (and I am not an old man, although I am sometimes called so) are to-day twenty inches in diameter: so you see they grow very rapidly. We ought to plant more trees like the oak and the ash trees for timber. For those purposes they would be valuable.

I was delighted to see a statement in one of our exchanges, that in England the growth of forest-trees had nearly doubled within comparatively few years; and that leads me to say, that I agree with all that has been said in the essay in regard to the Scotch larch. I believe there are thousands of acres upon which the Scotch larch ought to be planted. I do not like the American larch as well. The Scotch larch will adapt itself to all localities. If you have a Scotch-larch plantation, you can cut down the smaller trees, which will be useful as fence-poles, bean-poles, and for such purposes, until you have sufficiently thinned it out, and then the larger trees become very valuable for timber. I believe also in chestnut-trees. I do not know as I do in our locality, where the boys pound them so badly in order to get the chestnuts. I think there are a great many acres of rocky land that are now pasture-lands, or possibly are covered with bushes, on which the American chestnut should be planted. Go into the market, and see how chestnuts sell: there is nothing, perhaps, that sells better than the edible chestnuts. They will reproduce themselves almost exactly. If you intend planting them, you should select the large-sized chestnuts, keep them moist through the winter, and plant them in the spring where you want them to grow. It is rather unsafe to plant them in the fall, because the squirrels will be likely to get them. You will soon have a plantation of clean trees, which in a few years will give you a fine crop of nuts, which will bring you a good sum of money.

This leads me to say another word. You may say, "You are planting for posterity." Well, if somebody had not planted for us, we should not be enjoying the blessings we have at the present time. My father planted shellbark-trees, and from those trees I gather nuts to-day. The walnut-tree fades a magnificent yellow in the autumn.

QUESTION. How do you set out your trees?

Mr. HYDE. The chestnuts and walnuts should not be planted in the autumn, as I said, because the squirrels will get the most of them. Keep them moist: do not keep them wet; if you do, they will rot. Then plant them in the spring, and, during the first season, dig away on one side of the young tree with a sharp spade (although we have an instrument that we have prepared for this purpose), and cut

the taproot: it runs down deep into the ground. I have seen the taproot of a pecan-nut tree, which was longer than the tree itself was. The taproot will go down three or four feet, according to the nature of the soil. I allow the trees to grow from the seed the first year, and then the next year transplant them. After two or three years they will have taproots again, when they need to be taken up and again transplanted, cutting off the taproot as before. After you have done that two or three times, they will have as excellent a growth of fibrous roots as you ever saw on any trees. Now set out those trees, and you will add permanent value to your real estate by doing it.

QUESTION. Can't I set them out from the pastures and fields where they have grown naturally?

Mr. HYDE. Possibly, if you can find trees small enough.

Mr. ——. I can find plenty.

Mr. HYDE. You may do pretty well that way; but all the nut family are difficult trees to transplant. The pecan, the shellbark, and pig-nut are rather difficult trees to transplant.

QUESTION. Will the pecan grow here?

Mr. HYDE. Yes, sir, tolerably well.

QUESTION. How about the elm?

Mr. HYDE. The elm will grow almost everywhere, until the roots will cover nearly every inch of your plantation. Along the streets, in towns where you want elms for shade-trees, you cannot very well avoid having their roots run into your land, and sucking your soil a good deal.

QUESTION. Does grass grow well under elms?

Mr. HYDE. Fairly well.

QUESTION. So as to make a good-looking lawn?

Mr. HYDE. Pretty good. Rather strong, moist soil is best for the chestnut. In addition to its value for furnishing nuts, it has a commercial value as timber for telegraph-poles, railroad-ties, etc. If I should tell you what we have received for chestnut-trees for those purposes, you would hardly believe me. Some of these American chestnuts are two-thirds as large as the Spanish chestnut, and of much better quality.

Mr. DAMON (of Northampton). I have a tree which yields me about three bushels of chestnuts a year.

Question. I would like to inquire whether the box-elder has ever been grown in this part of the country. It is a famous tree in the Rocky Mountains and on the plains. It is a quick grower, and a magnificent-looking tree.

Mr. Manning. It is a very thrifty-growing tree in a rich soil. It does not long remain a handsome tree. It grows one-sided after a while, the top branches die, and it does not make so handsome and permanent a tree as the maple. It is certainly very common in the Rocky Mountains. You will find it on the streets of Denver.

The chestnut-tree is very easily grown in this section. Last fall, the 20th of October, I sowed several bushels of various kinds of nuts, — chestnuts and walnuts, — and they came up remarkably, varying in height from four inches to two feet. Usually the nuts grow deeper in the ground than they grow out. The trees require transplanting. I have growing I do not know how many thousands, and they grow from four inches to a great height. The pecan exceeds them all in growth. They have four times as much bulk in the roots as in the top, above ground. I took them up this fall, and put them in my cellar. I planted my seed in the fall, and I suffered nothing from squirrels or mice.

The elm has been disapproved of somewhat, on account of its throwing out a great many roots; but there is an increasing call for elm-trees in nurseries, and an increasing call for large-sized trees. I am quite sure they will grow very well from seed; but care needs to be taken that they do not grow too long without being thinned out, else they will choke each other. The white pine and evergreen are among those that make the most shade. The Scotch pine and Austrian pine, as well as the white pine, are adapted to extremely barren, dry soil. Even in a very sandy soil they will take root, and grow. The white pine, if there is a small sod taken up with it, can be transplanted with great safety. If you shake the earth off of the roots, it will not be likely to live. The best examples of tree-planting I know of were by John A. Hall, more than thirty-five years ago. He would get his pine-trees, cutting them up with little sods, stretch his line, and set them out in rows ten feet apart each way, for ten dollars an acre; and, of the trees he planted, thousands have been sold for board-logs. When I

was nine years old, there was a certain piece of land in New Hampshire without a living tree on it. When I was fifty years old, forty-one years afterwards, there were pine-trees growing there which would make a cord and a half of wood at least, and were fifty or sixty feet high, which had grown in forty-one years.

Question. Is not one reason why a great many evergreens die, because they get frozen?

Mr. Manning. Yes. If trees are frozen out of the ground, and then thawed, it is very fatal.

Question. I would like to inquire, in regard to Norway maples, whether they are not much preferable to other maples for transplanting?

Mr. Manning. Well, they are usually thicker than rock-maples, and they make a very rapid growth. I think they do well in a rich, alluvial soil. The European sycamore-maple is a good tree near the seashore, but not so successful in the interior. All poplars grow near the seashore: they grow down near tide-water. There is nothing better, that I know of, for a hedge, than the American arbor-vitæ. The Norway spruce makes a good hedge, as all spruces do. The white pine can be trimmed into a hedge.

The Chairman. A desire has been expressed to hear from Mr. Hadwen.

Mr. O. B. Hadwen (of Worcester). After the paper which has been read, and the lengthy discussion which has followed, I think the ground has been pretty well gone over in relation to trees and tree-planting; but, something having been said in regard to the Norway maple, I will say a word or two upon that subject. One great advantage of the Norway maple is, that you succeed with that where with other maples you would fail. For instance: if you have a very stiff, clay soil, where the surface has been removed, and you set out a Norway maple there, it will thrive much better than other maples. That is one of the strong points of the Norway maple.

This subject of tree-planting is one which covers a great deal of ground. I fully believe in planting trees for economic and ornamental purposes. Whoever plants trees for ornamental purposes ought to live to see the time when they are of great value for timber, and for boards, which they can

use in their farm-buildings. I desire to illustrate this one point: twenty-six years ago last spring I planted the European larch that has been spoken of, and this last summer of 1880 I cut some of them down; and many of them yielded timber which squared eight by ten inches, and was thirty feet long. I used those larches in my buildings, and they were the best timber I ever had. This shows how rapidly the European larch will grow under favorable circumstances. I had the pleasure of them when they were ornamental trees, and now I have the use of them in my buildings. I speak of this, that these farmers may know that they can plant ornamental trees about their buildings, which will ultimately be of great value in the buildings themselves. I have noticed about Southborough, white pines, which have been planted for ornamental purposes, that would make good, respectable saw-logs. There is no tree more easily transplanted than the white pine, if transplanted under the right circumstances, and in the right condition. They are easily raised from seed, and grow very rapidly; and, if transplanted when they are young, no difficulty will be experienced in growing white pines to advantage.

In 1846 I planted some pines to shelter my buildings from the wind. They are some five hundred feet above tide-water, and north-east storms beat upon them fearfully. I did not like the feeling of the wind, and so, a little distance off, I planted some white pines, and they have been a great satisfaction to me for the last thirty years. They are now good saw-logs, and I have no doubt my friend Hyde would sell them at auction at a good price.

In regard to the introduction of trees from China, Japan, and the Rocky Mountains, of which the essay speaks, I have growing on my place some of those trees, and I am particularly pleased with their growth. I have on trial a number of the trees mentioned in the essay, and, as far as I am able to judge, I fully accord with what Mr. Robinson says. The trees and shrubs of Japan will do well with us: they seem to thrive as though they were native to our soil. Of the trees and shrubs he has spoken of, which I have growing, I would particularly mention the Japan larch, which is not as strong a grower as the European larch, but it has a very

symmetrical shape. I think it is a promising tree, particularly for ornament.

Mr. HAPGOOD (of Shrewsbury). The paper to which we have listened is a very able and comprehensive one, and I am much interested in the subject. The trees on my land were all planted by myself. There was not a tree on it when I bought it, neither in my pasture nor on my farm. The elm-tree is my favorite, and the rock-maple is another one for which I have a preference. I have some rock-maples along the street in front of my farm for nearly half a mile: they were planted about twenty-five years ago, and they are from sixteen to eighteen inches in diameter now; the trunks are fifty feet high or more, and the branches extend laterally forty feet. It is a magnificent line of trees. Between the elm and rock-maple, I hardly know which is to be preferred. My objection to the elm-tree is, that the drooping character of its branches is such that it is liable to be damaged by ice in winter. My elm-trees have suffered very badly by having the large branches break off; but I have pruned them up, and they have recovered in part, although they are not in so good a condition as they would otherwise have been. The hemlock is a beautiful tree: I admire it. In driving to Worcester, years ago, I noticed the hemlocks near Quinsigamond Lake, and I determined to have some of them on my ground: so I took my man, and went down there. We got some that had attained a good size (taking them up carefully), and planted them; and every one of them died.

The CHAIRMAN. A question has been presented here, which some one wishes to have answered, and perhaps there will be no better time to have it answered than now. The question is this: Do apples from trees the trunks of which have become diseased keep as well as apples from healthy trees? Can any one here answer it?

Mr. BENJAMIN P. WARE (of Marblehead). Mr. Chairman, I have no hesitation in stating that apples from an unhealthy stock will not keep so well as those from a tree in a healthy condition. I have, in my own orchard, several trees that from some causes are unhealthy and diseased. The apples from those trees will not keep anywhere near as well as apples from vigorous trees. Even if the trees are

old, if they still retain health and vigor, I am confident that the fruit will keep much longer than from trees which are diseased. I do not know that it is necessary to speak at length upon this question. I would simply state, so far as my own observation is concerned, that I am positive apples will not keep so well from trees with diseased trunks, or that are unhealthy from any other cause. If the trunks are not decayed, or if the limbs are not decayed, if from any other cause the tree is unhealthy, my observation is, that fruit will not keep so well.

Mr. Clark. I am much interested in this discussion about growing wood; but it seems to me that those gentlemen who understand the matter, and who claim that there is a profit in growing it, should tell us what kind of land should be used for that purpose. For instance, what kind of land would my friend Hyde grow white birch on? I suppose we can grow from twelve to fifteen cords of white birch on an acre in eighteen or twenty years. That wood in the market to-day is worth four dollars a cord. It costs a dollar to cut it, and a dollar to draw it: that leaves you two dollars for your wood; and, if you cut fifteen cords from an acre, it will bring you thirty dollars for wood which you have been twenty years in growing. How much can you afford to pay for land on which to grow it? Certainly it will not pay to grow white birch in Newton; for I suppose there is very little land there that can be bought short of twenty or thirty dollars an acre, and to that is to be added the tax on the land. I take it the gentlemen of Newton would make more money by investing in railroads in the South-west than they would in growing white birch in that vicinity. But if you have land that is not worth more than two, three, or five dollars an acre, there you may grow white birch. My experience has taught me that no man can profitably invest his money in land to grow wood for the market, as the market is to-day, and pay over six dollars an acre. There are gentlemen here who have bought shrub-land, and have paid more than that for it, and have grown wood upon it; yet, if they can say they have got more than five per cent on their investment, I am mistaken. The point we want to understand is, on what land we shall grow wood. If we use our best land in Worcester County to grow wood on, —

land that is worth from twenty to forty dollars an acre to pasture cattle, — it seems to me that would be poor economy.

Mr. HYDE. I referred to certain lands on Cape Cod, and other barren lands all about New England, that are producing nothing, as suitable to be put to this use. I also said that some of these rugged hillsides might be profitably covered with trees. What I meant to say was, that these poor, unprofitable lands might be improved by growing trees on them. It would not do to take valuable land. I should not want to pay over a dollar or two an acre, possibly five, for land on which to plant pine or birch. There is much land in this State, however, that does not pay any interest whatever: that is the land which I would reclaim, and cover with verdure in place of the growth that has been destroyed.

Mr. CLARK. I do not believe there is any land in Massachusetts poor enough to grow white birch on, because I think you can do a great deal better by growing white pine, which is worth three times as much, and grows a great deal faster. In my neighborhood we get from ten to twelve dollars for it. It grows in twenty-five or thirty years: and if my friend Hyde has ever sold pine-lots, he knows that the men who have bought them have always got good bargains; for pine-land yields generally as much again as is estimated. But as to this sandy land that has been spoken of, which you can buy for two dollars an acre, I agree with him, and have for years, that the best thing the farmers can do with it is to grow white pines; but I question, Mr. Chairman, whether a man can be poor enough to keep land to grow white birches on. The best thing a man can do, if he has a piece of poor land such as has been referred to, is to plough it up, and seed it to white pine.

Mr. SLADE. I want to say a few words in behalf of the despised white birches. A man said to me, "If you had some poor land, you could make more money in raising white birches than you could in raising small fruit." I asked him to explain how. He said, "You can raise two birches on a square foot, can't you?" I told him I thought I could. He then said, "You can raise two on a square foot; and those trees, after having grown six years, will be worth a cent apiece. Now," said he, "you will get four hundred dollars on your acre every six years."

QUESTION. What would they be used for?

Mr. SLADE. For bean-poles.

The CHAIRMAN. All the small white birches in my neighborhood are bought up by men who send them to Boston, where they are used for hoops to bind boxes. There are three or four places in my vicinity where birches are raised, which are sold for some six or eight dollars a cord, and the bark is taken off to make powder of.

Mr. CLARK. It is well known that Concord has a monopoly of the powder-manufacture.

The CHAIRMAN. Another question has been handed in: What is the most convenient and economical method of hurdling, or confining, sheep upon cultivated land? It is said that Mr. Bowditch can answer that question.

Mr. E. F. BOWDITCH (of Framingham). I am sorry to say that I cannot answer it as accurately as I would like to, because I have only tried hurdling sheep one year. I had some old worn-out land that I wanted to renovate without ploughing, and I hurdled my sheep on it, beginning on the 1st of July. For a portable fence I merely took fence-pickets four feet long, and nailed them on to two-by-three spruce joist sixteen feet long. In the end of each joist I bored a little hole, and fastened it to another. For this purpose you can use a bolt, or a five-inch spike, or any thing of that sort. I extended my fence in a zigzag shape. This gives strength to the fence, so the sheep will not knock it over, nor the wind blow it down. That cost me, both the material and making, just a dollar a rod. I hurdled my sheep on about a sixteenth of an acre a day, and fed them a little corn daily by way of top-dressing the land. I moved the hurdle two or three times a day, and, when I went over the land with them the second time, I had a great deal more feed than when I went over it the first time.

QUESTION. How many sheep did you have?

Mr. BOWDITCH. I had fifty.

QUESTION. How much land did you go over?

Mr. BOWDITCH. I should say about one-sixteenth of an acre a day; possibly a little more. After I had been over it the second time, I could see a great improvement in the land; and my belief is, I have renovated that land very cheaply. The result is to be ascertained next year. If this

experiment proves successful, I propose to do it on a larger scale, and hurdle perhaps three hundred sheep.

QUESTION. How near together did you put your pickets?

Mr. BOWDITCH. The width of a picket, — four inches.

QUESTION. How much did you feed the sheep?

Mr. BOWDITCH. Less than half a pint a day to each sheep.

QUESTION. How long were you, from the commencement, before you returned the sheep to the same place?

Mr. BOWDITCH. It was in the neighborhood of between five and six weeks.

QUESTION. Then you began again?

Mr. BOWDITCH. I did. I hurdled it over the second time so as to try the experiment thoroughly, and my ground now shows the effect of it. Owing to the very heavy dews we had this year, the fifty sheep did not drink, on an average, two pails of water a day.

QUESTION. Do you think it was necessary to water them at all?

Mr. BOWDITCH. Some few of the sheep wanted to drink; and, if they wanted it, they ought to have had it. Some days, when we had not a heavy dew, they would drink a good deal more.

QUESTION. What had been the use of this land before?

Mr. BOWDITCH. The last cultivated crop was nine years ago. Last year's crop was hay, which hardly paid for cutting. In England they do not consider that a meadow produces good hay until it has been drained a number of years. They consider there is more hay on an old meadow than on a new. I wanted to see if I could not renovate some of the old fields, without ploughing them up, and get finer grass.

Mr. RUSSELL. Do you regard hurdling as any protection against dogs?

Mr. BOWDITCH. I never lost a sheep from dogs. They never troubled me in any way.

QUESTION. What kind of sheep?

Mr. BOWDITCH. Oh, a job lot.

QUESTION. Were they breeding-ewes?

Mr. BOWDITCH. Yes, sir. The most of the lambs were sold in March and April.

The CHAIRMAN. Owing to the sickness of Dr. Nichols, he will not be able to lecture to us this evening; but, in his place, Professor Morse of Salem will deliver a lecture at half-past seven o'clock. The time has now come when the meeting should be adjourned.

Adjourned.

EVENING SESSION.

The evening meeting was very largely attended, Mr. JOHN B. MOORE of Concord occupying the chair. The lecturer announced for the evening was Dr. J. R. NICHOLS of Haverhill; but he was unable to be present, and his place was very kindly filled, at short notice, by Professor E. S. MORSE of Salem, who delivered a very interesting and entertaining lecture on "Insect Life," to the great gratification of the audience.

At the conclusion of the lecture, the Board adjourned to Wednesday morning.

SECOND DAY.

The Board met on Wednesday morning at nine o'clock, and was called to order by his Excellency Gov. LONG, President *ex officio*. He said, "If the best part of Massachusetts was not gathered in this hall, I should say that I brought to you the good wishes of the Commonwealth. The first business before the meeting this morning is a lecture by Mr. EDWARD BURNETT of Southborough."

VARIOUS METHODS OF SETTING MILK FOR CREAM.

BY EDWARD BURNETT.

GENTLEMEN AND FELLOW-FARMERS, — In taking up the subject of my paper to-day, "The Various Methods of setting Milk for Cream," I feel as if it should be more properly called "A Paper on the Various Methods of extracting the Cream from Milk," as I am the only dairyman in the country who is introducing a revolution in the dairy business by the practical working of the centrifugal machine; and most of my paper will be devoted to this method.

Wanklyn, the English chemist employed by the city of

London to analyze the milk supplied to the various work-houses and public institutions, gives, in his little book called "Milk Analysis," the best and simplest definition of milk I have ever seen. He says, "Milk is a watery solution secreted by the mammary glands, and holds in a fine state of subdivision small particles of fat, which we call cream." Now the most important consideration in setting this watery solution is to obtain the fat to make butter. This depends upon a settled principle of hydrostatics, that one fluid which is lighter than another will rise, and float upon the surface. The specific gravity of milk and cream is so nearly the same, that it requires time, and it is almost impossible, to make a perfect separation. The rapidity of the ice or cold water deep setting over the old-fashioned shallow pan is easily explained, and is a point which many of the late inventors have strongly advocated. It is simply condensation by lowering the temperature from 80° or 90° to 40° or 50°. A cubic foot of milk at 50° is heavier than the same bulk at 80°; but the gravity of the cream is not changed proportionally, so that, in the dropping of this temperature thirty or forty degrees, the cream becomes relatively lighter, and rises much more rapidly. Another point to be noted in the rapid separation in deep pails is the globular attraction of the cream to the milk, which shows on the top of a twenty-inch pail five or six inches. This cream contains almost one-half milk, as it takes double the quantity of this to make a pound of butter as of that from the shallow pans. A disputed point, and one which Mr. Cooley has exploded in his submerged cans, is the opinion held by some dairymen, that contact with pure air is necessary to produce good butter. It is claimed that the animal odor is very objectionable; but, with proper care, this becomes only a natural odor, and one which does not injure the milk in the slightest: for let any one take the warm milk directly from the cow, strain into a glass bottle and seal it up tightly, plunge into ice-water until the animal heat is destroyed, then keep in a cool place, and they will find it sweet and fresh at the end of four days. The Lester milk-jar, extensively used in New-York City, is filled after this method, and with the most gratifying results.

Although still a young man, I have been extremely fortu-

nate, as all dairymen will agree with me in saying that the past ten or fifteen years have produced more improvements in dairy utensils than the previous half-century. In 1871, when I began, the Orange Company pails had just found a strong advocate and indorser in Col. Waring of Ogden Farm; then the Jewett and Orange Company milk-pans and others were introduced; a few years later the Cooley creamer and various deep-can methods were brought forward, and are to-day extensively advertised all over the country. Abroad, the Swartz or Swedish system, invented twelve or fifteen years ago, is extensively used: it is simply the deep setting of milk in cold water at from 35° to 40°, and differs only from our general deep system in the shape of the milk-vessels, which are made of heavy tin, like a common tin wash-boiler with about half its width. Another method found in Holland, in large dairies who prefer shallow setting, is called the "Destinon," or "Holstein." This consists of a large pan made of enamelled cast iron, five or six inches deep, twenty to thirty-five inches wide, and from thirty-eight to seventy-six inches long, set in masonry. This raised at one end, the cream is taken off from the other, over a flange bent outward and downward, with a kind of rake on little wheels which run outside: after that, lifting the pan still higher, the skim-milk is drawn off.

Both methods, the deep and the shallow setting of milk, have excited a great deal of attention and controversy, and both still have many warm advocates. I myself am fully convinced, by a series of personal experiments, that the same results can be obtained with either, and that circumstances should govern one's selection. In large dairies, with plenty of cold running spring-water, or plenty of water with a large ice-supply, so that the temperature of the milk can be kept between 40° and 50°, the labor is lessened, and the best results are sure to follow, with deep setting: on the other hand, with a cool, well-ventilated dairy-room easily controlled, and kept at a temperature of about 60°, success is assured with the shallow pans.

To-day the finest butter in the market (I mean that which has no local reputation), and that, whenever it was sold, would bring the highest quoted price, comes from the best Northern and Western creameries; and ninety-five per cent of this butter is made from cream raised in deep vessels.

On the other hand, the famous Darlington butter of Philadelphia, and many of our choice small dairies in New England that obtain from sixty cents to a dollar per pound for their butter, still use the shallow pans, and to-day, if I had a small herd of Jersey or Guernsey cows, and wanted the best of cream for my own table, as well as choice butter, I should select the Ferguson Bureau Creamery, which is simply a set of shallow pans, in a perfect miniature milk-room, and, if the directions are properly carried out, easily keeps an even temperature of about 60°.

I now come to the centrifugal method of separating cream from milk, and beg that you will look upon me more in the light of a student who is trying to solve this wonderful process, and who is here to give you the simple results of a year and a half's study and observations, as well as those of others, rather than as a professor trying to teach and introduce any new system.

The process is very simple, and, like most great inventions, easily explained. All dairymen know that the separation of cream from milk is the result of gravitation: the fat globules, being of less density than the watery portion of the milk, rise to the surface. Now, the centrifugal machine produces a very powerful and forced gravitation, which develops this separation almost instantly and with great rapidity. At a hundred and twenty revolutions per minute, a weight six inches from the shaft would be equal to two and a half times its specific gravity.

At 600	revolutions per minute .	. $61\frac{1}{2}$	times its sp. gr.
1,000	" " " .	. 170	" " "
2,000	" " " .	. 684	" " "
3,000	" " " .	1,537	" " "

As early as 1859 Professor C. I. Fuch of Carlsruhe, Germany, experimented with a centrifugal machine for separating cream from milk; but it was not until 1877, nearly twenty years later, that Ledfeldt developed and patented a machine for the purpose. This excited much interest in Europe; and, later, machines were built in Denmark, Sweden, and Norway, differing, however, only as to their method of obtaining the final separation of the cream from the skim-milk. In this country, three years ago, Rev. H. F. Bond of

Northborough, Mass., worked out this problem, and obtained cream in about one hour with a small, crude hand-machine, consisting of two glass jars attached to a spindle, and making only two hundred revolutions per minute. After months of hard study in perfecting his little machine, he found, to his surprise, in applying for a patent, the Germans already in the field.

I first began to use the centrifugal in May, 1879, and to-day shall give you results of many of my experiments with this first machine described as follows: It is a cylindrical basket on an upright spindle, and in it are two floats, or dams, extending from top to bottom. This basket is about two feet in diameter, with a twelve-inch opening, and a top flange extending some two inches upwards and outwards.

This is substantially all as I first received the machine, and it could be used for separating various fluids or solids of different specific gravities. My first experiment was at twelve hundred revolutions a minute, running about twenty minutes, then stopping the machine slowly, and, when at rest, skimming off by hand the cream which lay on the surface in large, thick patches, and of the consistency of clotted cream. At a subsequent trial I used a bent tube, and scooped off the cream while the machine was in motion. Then I adopted a simple arrangement by which I caught the cream, thrown over the flange already described, in a stationary pan, on top of the curb, which surrounded the basket, and let off the skim-milk by valves, designed by Rev. Mr. Bond, in the perpendicular wall, which are perfectly controlled, even when at full speed. This enabled me to use it as a continuous machine. Having increased the speed to fifteen hundred revolutions per minute, I run about eighty gallons per hour.

On the 4th of June, 1879, mixing thoroughly all my morning's milk, seven hundred and four pounds were run into the centrifugal, and yielded thirty-five pounds eight ounces, or a pound of butter to 19.83 pounds of milk. This was churned in an old-fashioned barrel-churn after twenty-four hours, at a temperature of 50°, and the butter came in exactly seventeen minutes. Six hundred and sixty pounds of the same milk, set twenty-four hours in deep pails immersed in water at 45°, and skimmed very carefully by hand, yielded thirty-two pounds four ounces, or a pound of

butter to 20.46 pounds of milk. This was churned, after standing twenty-four hours, at 60°; and it took fifty-three minutes to bring the butter. I wish to call your attention to the difference of temperature in the churning of the two different lots of cream (ten degrees in favor of the centrifugal), and the length of time occupied with that cream (only seventeen minutes against fifty-three of that from the pails). About these same results in favor of a slight gain for machine were obtained from many subsequent experiments. Wishing to try the effect of old milk, I took (July 1), and set a portion of the morning's milking, thoroughly mixed in pails, in a tank, the water at from 45° to 50°. The next morning, twenty-four hours afterwards, a hundred and sixty-five pounds run through the machine yielded eight pounds, or a pound of butter to 20.62 pounds of milk. A hundred and twenty-six pounds skimmed carefully in the pails by hand yielded six pounds, or a pound of butter to twenty-one pounds of milk.

As you will observe, in all my trials there is a slight gain in favor of the centrifugal machine over the ordinary methods; and the Germans, with their repeated experiments, have also invariably found a gain of from six to twelve per cent.

The cream obtained by this method is remarkable for its peculiar sweet flavor and smoothness. Running it off slowly, then cooling below 50°, it is even thick enough to cut with a knife. From "The London Farm," July 2, 1877, I obtain the following analysis: —

Water	29.546
Fat	67.633
Caseine	1.174
Sugar	2.247
Ash	.122
Albumen	.248

The skim-milk is very thin and blue, and has a hard, peculiar flavor, although perfectly sweet, and remarkable for its freshness, like the cream. My chemists, Messrs. Lawrie and Terry of Boston, report the following analysis: —

Water	89.68
Fat	.90
Caseine, etc.	4.24
Milk-sugar	4.44
Ash	.74
	100.00

After running off the last of the skim-milk, we find a most offensive and greenish slime on the rear walls of the centrifugal basket, from one-sixteenth to one-eighth of an inch thick, which has the following analysis: —

Water	67.38
Fat	3.25
Ash	3.88
Caseine	25.49
Decomposed products, etc.	100.00

The letter from my chemists accompanying this analysis struck me as rather amusing, and I take the liberty of reading it: —

Mr. Burnett.

Dear Sir, — I do not know in what quantities you get this refuse; but the best use of it, I should think, would be for fertilizing purposes, as it is very rich in nitrogen and phosphate of lime.

Yours, etc., A. D. Lawrie.

From Dr. Fleischmann's paper, published in Germany, I find he also speaks of this slime as follows: —

"Although the milk treated in the various experiments was always passed through four fine metal sieves before being passed into the machine, more or less dirty matter was invariably found on the side of the drum at the completion of the process: hence it appears that the rapid centrifugal motion cleanses the milk or cream far more effectually than the best-made sieve could do, and it is only natural to suppose that butter obtained from such cream should be proportionately finer."

Thinking, perhaps, that, by the great force by which the cream is thrown off from the machine, a breaking of the globules might take place, which would in theory account for the rapidity of churning, I asked my friend and most obliging neighbor, Dr. E. L. Sturtevant, to come up with his microscope, and spend the day at my dairy. His report, which also contains an examination of the refuse already spoken of, I read with great pleasure, —

"The centrifugal cream examined Jan. 7 has certain peculiarities as examined under the microscope.

"First, Its absolute purity; each globule standing out distinct and round, and no foreign material of any nature to be detected.

"Second, Contrary to my expectations, there were no ruptured globules.

"Third, There was a noticeable uniformity between the sizes of the globules of each sample, the first cream taken from the machine having larger globules than the last cream. When, however, the machine was run continuously, this should become not so evident.

"The specific gravity of the centrifugal cream as taken from jars prepared for market was 962; and a later result, made a few weeks ago, gave 956.50. It is evident that this specific gravity could be greatly reduced by allowing the cream to remain under centrifugal force influences a little longer before removal.

"After a large quantity of milk has been passed through the machine, a quantity of dirty, greenish, offensive slime, is found to accumulate, as I am told by Mr. Burnett, upon the circumference. Some of this was brought me for examination. It appears to consist, as the microscope afterwards verified, of the impurities which existed in the milk."

The butter obtained from the centrifugal cream is like any other good butter, except that we have noticed a slight loss of color.

An important fact lately developed by Dr. Sturtevant is its melting-point, 98°, being remarkably high. He found exactly the same result, however, from my own dairy as from that of my neighbors, which furnished two samples from the same milk treated by the machine and by the ordinary process, and was 98° and 94° respectively.

At present I am using two machines, — one continuous, and the other intermittent; and, like my first machine, these were invented and built by D. M. Weston of Boston. They are constructed in almost every particular like a centrifugal hydro-extractor.

The most favorable results are obtained when the milk is warm from the cow: it then throws off the thickest cream in the shortest space of time.

Let me here state that the pressure exerted on the walls of the cylindrical basket of a two-foot machine at two thousand revolutions per minute is two hundred pounds to the square inch, or fifty pounds greater than a government inspector requires on a new high-pressure steam-boiler: so that a machine must not only be constructed of the best material, but in the most thorough and workmanlike manner.

In an excellent paper by Dr. T. E. Englehardt of Syracuse, N.Y., on the result of European experiments, he says, for each experiment contained in the following table two hundred pounds of milk were used; and the correctness of

the obtained results were verified by exact chemical analyses of the butter, buttermilk, and skim-milk obtained in the operation.

The vessels for the ice method held fifty pounds of milk each, and were filled to a depth of sixteen inches. Time employed for setting, thirty-four hours. The same length of time was adhered to in setting after the Holstein method, except from the end of May to the middle of September, when it became necessary to reduce this time twenty-two to thirty hours, — due to the condition of the milk. A Ledfeldt centrifugal running ten hundred and forty revolutions per minute accomplished the work in about thirty-one minutes; but from Aug. 8 to Sept. 2 the machine ran very unsteady, in fact, so much so, that on Sept. 3 the velocity had to be reduced to nine hundred and fifty revolutions per minute, and the time of running prolonged to thirty-six minutes and a half. The butter obtained was worked once, then weighed, and after that salted.

	Pounds of Milk for One Pound of Butter.			Proportional Results between.			Days experimented.	The Centrif'l yielded more Butter in p.ct.	
	Centrifugal.	Ice 34 Hours.	Holstein Method.	Centrifugal.	Ice 34 Hours.	Holstein Method.		Than Ice.	Than Holstein Method.
1879.									
May . . .	27.6	30.0	30.4	100	92.3	90.6	14	8.3	10.4
June . . .	26.4	28.3	28.8	100	93.2	91.2	21	7.3	9.6
July . . .	26.8	28.0	30.5	100	85.7	87.9	7	4.5	13.8
Aug. 1, Sept. 2,	28.5	27.7	31.7	100	103.2	90.1	9	÷3.1	11.0
Sept. 3 . .	26.6	27.6	30.9	100	96.4	86.2	10	3.7	16.0
October . .	24.3	28.7	27.9	100	84.7	87.0	16	18.1	14.9
November . .	24.6	31.5	28.4	100	78.1	86.5	9	28.0	15.6
1880.									
December . .	24.2	28.5	27.4	100	84.9	88.4	9	17.8	13.1
January . .	25.8	27.8	28.0	100	92.9	91.9	10	7.6	8.8
February . .	26.4	27.4	27.8	100	96.3	94.9	10	3.8	5.4
March . .	27.8	28.8	29.5	100	96.4	94.3	18	3.7	6.0
April . .	29.3	28.4	30.1	100	96.1	94.0	7	4.1	6.4

In the buttermilk obtained from a hundred pounds fresh milk there were found of fat, — in that of the centrifugal, .07; in that of the ice method, .06; and finally, in that of the Holstein, .07 pounds. Hence the better results of the centrifugal must be due entirely to the smaller amount of

fat in the skim-milk, which was verified by analyses, since the skim-milk of the centrifugal contained from .25 to .44 per cent fat; that of the ice method, between .34 to 1.54; Holstein method, .40 to 1.03 per cent: average during the year, .35, .62, .58 per cent.

On the 27th of July (last summer), while abroad and in Paris, I received a written invitation to be present at a trial of the German Ledfeldt machine, which was to be given to a few French *savants* in agriculture at the Show and Experimental Rooms of Gustave Stahmann, No. 11 Rue des Immeubles Industriels. Taking two college-friends who spoke French fluently, I presented my card, and was very graciously received by the proprietor and by Ledfeldt himself, whom I found most agreeable, and, to my surprise, interested in the Deerfoot Farm, and that he had in his pocket a copy of my address before the American Dairyman's Association.

The machine was a small one, twelve or fourteen inches in diameter, and speeded at three thousand revolutions per minute, and had a self-delivery. Our experiment, of which I have a record, only proved its capacity of delivering above twenty-five gallons per hour.

He also strongly advocated the cooling of the cream in its delivery down to 35° or 45°, and churning in small creamers. He also told me that there were about two hundred of his machines in use, — quite a number in Brunswick, Germany.

During the lecture, the centrifugal process was illustrated by Rev. Mr. BOND, who filled several small glass tubes with fresh milk, and, after operating the machine about fifteen minutes by hand, the tubes were passed around among the audience, showing about seven per cent of cream on top. Mr. Bond stated that the percentage was rather small, owing, probably, to the fact that the milk was not very rich.

QUESTION. What kind of a churn do you use?

Mr. BURNETT. I use an old-fashioned barrel-churn, such as is used in England and Holland, fifty-gallon capacity, with three stationary floats. Between the staves, in three equal parts of the circumference of the barrel, is put a strip of wood about four inches wide, that acts as a stationary dasher. It takes from seventeen to thirty minutes to churn

the cream from the centrifugal machine. I do not like to churn cream that is as thick as it comes from the machine, and I generally add one part milk to two parts of cream, to reduce it. I think Mr. Cheever will agree with me, that very thick cream does not produce so good butter, nor produce it so quick.

Mr. Cheever. Nor so much of it. Can this system be adopted by individual farmers, or must we co-operate, and have the work done in large establishments?

Mr. Burnett. My honest opinion is, that it will not pay to run a centrifugal machine by power with less than two hundred cows. To run a centrifugal by hand is a great deal of work: it would be like churning every day. I believe the thing will be made practical. I think that within ten years, as soon as the controversy about patents is settled, we shall have small centrifugal machines that it will be practicable to use on small farms. At present these machines are quite expensive. In Germany they cost from a hundred and fifty to a thousand dollars. I have, I believe, the only three large machines in the country, and they cost to build from four hundred to five hundred dollars. The material and work on the basket of the first centrifugal machine cost three hundred and eighty-five dollars. They must be made better than any common agricultural machinery: they would kill off all the farmers within a five-mile radius if they were made like the horse-rakes and mowing-machines of the present day.

Mr. Ware. How long have the machines been in use in Germany?

Mr. Burnett. The first machines were brought out in 1877, by Ledfeldt, in Brunswick, Germany. In actual experience with the centrifugal machine, the cream produces better butter by reducing the temperature. If I cannot churn my sweet cream immediately, I put it in ice-water, and reduce it to forty degrees, and churn the next morning perfectly sweet cream. I am a strong advocate of sweet cream.

Question. Is the amount of butter as great from sweet cream as from sour?

Mr. Burnett. All the European experiments which have been conducted during the last six or seven years have been

decidedly in favor of sweet cream. The best English and Irish butter is made from sweet cream. I was on the fence until I went abroad. After looking into their methods, and eating their butter, I came home a strong advocate of sweet cream; and to-day I churn all my cream, if possible, sweet. I have a little drawback in the cream that is sent to Boston, and comes back if not sold. That may be very slightly turned. But, if I was to make any butter (as I frequently have orders to do) for a big dinner or other gathering in Boston, I should select the sweetest cream I had, and should feel sure that it would produce the best butter. That is a strong point. I have no doubt there are lots of men here who would like to dispute this point.

QUESTION. How long will that butter keep, made from sweet cream?

Mr. BURNETT. I have kept it six weeks in a refrigerator.

QUESTION. In what temperature?

Mr. BURNETT. Fifty-five to sixty-five degrees, probably.

QUESTION. How much more expensive would it be to churn whole milk than to churn the cream? Could it be done?

Mr. BURNETT. You would not get as good results. It could be done with the centrifugal. It is done abroad in certain countries. In Holland, I think, whole milk is churned to a considerable extent. They want to use their butter-milk for cheese.

Mr. BOND. You would not get the same quantity?

Mr. BURNETT. No, sir.

QUESTION. How old is your milk before you put it into the centrifugal?

Mr. BURNETT. We separate in the morning. Part of it is twelve hours old, and the rest is from morning's milk. Our milk, at this season of the year, does not begin to come into the dairy much before half-past seven. We begin as promptly as possible at the dairy in the morning, and we run the milk as fast as it comes in. Just before I churn, I bring it up to a temperature of about fifty-four or sixty-two degrees. When I churn in very cold weather, I bring it up to sixty-two; in summer I churn at fifty-four.

QUESTION. Have you noticed any difference in the cream which has been cooled and that which has not?

Mr. Burnett. Very great difference. The moment the cream comes from the centrifugal, it is at a temperature of about seventy-five to eighty degrees. It is plunged at once into ice-water, and reduced to forty degrees; and that cream will keep very much sweeter than it will if it is set aside, even for two hours, and then plunged into ice-water. If it is set aside for six hours, it is almost impossible to keep it sweet for twenty-four hours.

Question. Without regard to souring, how is the butter from it? Is it more easily obtained, and better, when the cream has been cooled, and then raised again to the churning temperature?

Mr. Burnett. Yes: I am very strongly in favor of that practice, and carry it out in my own operations. Just exactly what the difference is, I am not prepared to state from my own experience; but, after talking with some of the best dairymen in Europe, and reading their experiments, pounds of milk for pounds of butter, I have adopted it. I have no figures now to back it up; but I intend to try the experiment myself.

Dr. Wakefield. Is there any difference in the color of the butter from cream raised in this way, or from deep setting or shallow setting?

Mr. Burnett. Yes: we notice a slight loss of color from the centrifugal machine. I am not prepared to say from my own experience (I wish Professor Alvord would answer that question); but I think there is a little better color obtained from milk set in round pans than from the deep pails.

Dr. Wakefield. Is it so marked that it is objectionable in the market?

Mr. Burnett. No: the difference in the color from the different settings of the milk is scarcely perceptible. It takes good young eyes to detect it.

Mr. Sedgwick (of West Cornwall, Conn.). Does it not take longer to churn sweet cream than it does sour?

Mr. Burnett. Yes: the time is extended on my churning some fifteen minutes by using the sweet-cream method that I have adopted since I returned this fall.

Mr. Bond. Do you get as much butter from sweet cream as from sour?

Mr. BURNETT. I think we get more, or fully as much, certainly. The difference is very slight.

QUESTION. I would like to ask whether a churning from sweet cream should not keep longer than six weeks?

Mr. BURNETT. That was simply a little experiment that I tried. When we stop this machine, there are big bunches of cream on the side; and I took some of those bunches of cream, and whipped them up in a bowl, and made a few ounces of butter, which I kept in a refrigerator for six weeks. I am very happy to say, that the demand is such for my butter now, that I cannot keep it hardly six hours. I have not set any butter aside to try for any length of time. Mr. Weston, the inventor of this machine, last May asked me to salt down for him forty pounds in a stone crock; and he came to me last week, and said, "My butter is just gone. It was perfectly delicious." It was salted only four ounces to ten pounds. He used the last of it last week, and came to me for some fresh butter for Thanksgiving. But he said that was just as good as fresh butter; he would not ask for any better butter; that it was uniformly good up to the very last.

Mr. CHEEVER. Has this new principle been applied in the dairy in any other way, than for separating cream from milk, successfully?

Mr. BURNETT. Last winter I had a little basket made to set into a large centrifugal machine that was just the diameter of this basket. It went into the machine, and was fitted on to a core that is on the inside of the machine to run the spindle into, to run the machine. It was made like a sugar-extractor. These centrifugal machines are used more extensively in the manufacture of sugar than in any other branch of industry. They have come now into general use, — so much so, that any refinery which has not its centrifugals cannot compete with those that have. I obtained, as I say, a little basket made after the manner of a centrifugal sugar-basket, with small holes about a sixteenth of an inch in diameter perforated all around the sides. I placed in that basket a bag of butter, started my machine, and ran it thirty seconds; and, at the end of the thirty seconds, stopped it as soon as possible. I found, upon taking my bag of butter out, that, even under pressure, I could not get the

buttermilk out of it as completely as I did by this process. It was so successful, that I have now a big basket, which I will show you when you visit my dairy, and work all my buttermilk out by the centrifugal force. You can put your hand between the curb and the basket, and feel the fine spray from that perforated basket, which actually prickles you, it strikes the back of your hand so sharply.

I went further; I made some little blocks that had holes cut in them about the size of a quarter-pound pat of butter. The weight was all guesswork: I did not care whether it varied one way or the other; but that was about the size of the hole. These blocks were fitted on the circumference of the basket. I had fitted on the back side of those blocks little round blocks of wood which had my Deerfoot-butter mould on them, and filled three or four of those little blocks with butter, — just took the butter up from a tub or from a drawer, and jabbed it in, as you would put putty into any hole, — and then started my machine, and ran it three minutes. When I took those blocks out, I found that the butter had been pressed right through the holes back on to the little round blocks; and there was the most perfect print on the butter you ever saw. It had been subjected to a pressure of a hundred pounds to the square inch, — a very even, steady pressure; and the mark on that butter was as distinct and as beautiful as if it had been carved by an artist.

QUESTION. By extracting the buttermilk in that way, you can handle the butter in a granular form?

Mr. BURNETT. Yes, sir. My butter is washed three times with pickle in the churn. The moment it comes, before it gathers, when the particles are about the size of an English Champion pea, we stop the churn, draw off the buttermilk, and wash the butter three times with brine. Then we take the butter up with our wooden shovels, and lay it in a cloth eight or nine feet long, spreading it evenly, roll this cloth up, and set it right into the big basket (I think my new basket is twenty-two inches in diameter), start the machine, and, the moment it reaches full speed, stop it, take the butter out, and then salt it.

Mr. CHEEVER. Is this method of moulding likely to be a success?

Mr. BURNETT. I think if I had time I could make a success of it; but I should be obliged to have a machine made on purpose. Mr. Weston was so much pleased with it, that he said he would make me a machine. I do not know exactly what I should want; I should have to spend more time on it. I do not think it is a success at present.

QUESTION. How strong a brine do you wash your butter in?

Mr. BURNETT. Full solution of brine. I am not so very particular about it. This globular butter has so little affinity for salt, that Col. Allerton, of the National Dairyman's Association, told me, when he was on here from Chicago, that they put butter into barrels in that way, and you could scarcely taste the salt after the butter had lain in brine three months, because there was no affinity between the butter and the brine. We run the brine in at about the temperature we want to work the butter.

QUESTION. Why do you use the brine at all? Why not use fresh water?

Mr. BURNETT. Because almost all water contains more or less impurities, and salt neutralizes those impurities. You never need fear that the brine will affect your butter.

QUESTION. Don't you salt your butter after you wash it in brine?

Mr. BURNETT. Yes: this brine does not salt the butter at all.

QUESTION. You have to break the globules to salt your butter?

Mr. BURNETT. Yes: then we form a compact mass of butter. I like very much to have my butter salted, and laid away for five hours. If butter can be laid away from four to seven hours, the salt permeates the mass, gradually dissolves, and is ready to work up; and the grain of the butter is set as firmly as it is at the end of twenty-four hours. At the end of twenty-four hours, if your butter is put away in a cold place, it is very hard to work it, and very difficult, as every expert knows, to work it up without destroying the grain.

Mr. CHEEVER. You would prefer to finish it up at once?

Mr. BURNETT. Yes: I would rather finish my butter up, and then leave it for twenty-four hours, and then let a green hand or an ordinary man go through it, and crush it.

QUESTION. When the cream is separated from the milk, a few minutes after it is drawn from the cow, is it any purer or freer from flavor than when it is allowed to remain in the pan a day or two, and then skimmed in the old-fashioned way?

Mr. BURNETT. I don't know. I think it is. Professor Arnold of Syracuse said to me, "Why, Burnett, I believe you could feed a cow on onions, and the centrifugal would throw the odor right out of the milk!"

[At this point a recess was taken, and the members of the Board, with many others, on the invitation of Mr. Burnett, visited Deerfoot Farm, where they were courteously shown every department of the extensive and well-ordered establishment, and had an opportunity to witness the centrifugal machine in operation.]

On re-assembling at twelve o'clock, Mr. JAMES S. GRINNELL of Greenfield said, —

At this large and successful meeting of the Board, we miss the genial face and friendly greeting of one of the members of the Board, who was also one of the Committee of Arrangements delegated from the South Middlesex Society, who is now confined at his home by a serious, and, we fear, dangerous illness. Successful as have been the efforts of the other members of the committee, and these gentlemen of Southborough, some of the members of the Board have thought that it was proper, and that it would be kind in us, to offer some expression of our feelings in regard to our friend Mr. Damon. I therefore have the honor to offer the following vote: —

"*Resolved*, That we, the members of the Massachusetts Board of Agriculture, having to-day heard of the serious illness of Mr. Thomas J. Damon, our colleague of this county, hereby direct the secretary of the Board to convey to him this expression of our sympathy, and the hope of his speedy restoration to health."

Mr. J. B. MOORE. I desire to express my sympathy with this resolution. I have been a member of this Board some time, and have been associated with Mr. Damon in that relation; and I have also known him for a long term of years, and have known him as one of the best practical farmers of Middlesex County. I have known him as a useful member of the Board, and I am very glad to support the resolution

offered by my friend Mr. Grinnell. I can say that the Board has had no more useful, practical member than Mr. Damon. I have known him, as I have said, for many years; and his example as a farmer in Middlesex County has done a great deal for the farming of that section in which he lives. More than that, he has a reputation which any man would desire, — the reputation of an honest man.

Mr. E. F. Bowditch. I would like to add a word. I saw Mr. Damon last Sunday afternoon. I have seen him several times during his long illness, and he has expressed very great interest in view of this meeting, and Sunday afternoon, which was the hundredth day he had been confined to his bed, suffering all the time, he desired to be remembered most kindly to his associates; and he wished me to express his earnest wish for the success of the meeting, which I promised to report to him as soon as it was over.

The resolution was adopted by a unanimous vote.

Gov. Long then addressed the meeting as follows: —

Gentlemen of the Board, — As it will be impossible for me to be present during the afternoon session, I feel it to be my duty to express the great satisfaction with which I have been present on this day. It would not be becoming, it would not be true, if I, not an expert in farming, should make a pretence of special interest in agriculture or knowledge of it; but I do claim to feel a most emphatic interest in the general subject lying at the foundation of the interests and the welfare of the Commonwealth. But, more than that, the specific reason why I am with you to-day is, because I believe it is the duty of the representative of the Commonwealth of Massachusetts, who holds an honorary position on this Board, to be present at least once during its meetings, so as to show the interest which the Commonwealth feels in the general subject of agriculture, and to express, however poorly, the tribute of respect which she ought to pay to the men who are promoting that science.

There are a great many special reasons why the morning has been spent pleasantly, and why, if I had any report to carry back, it would be a report full of satisfaction. It is certainly most significant, that, on this stormy day, this hall has been filled with such an intelligent and interested body

of listeners. This exhibition of these fruits of the field does credit, certainly, to those who have presented them. I do not know but I ought to say that I am a little sorry to see the "machine," which is so much objected to in politics, introduced among the farmers; and, having put my hand to it, I do not know but I shall be accused of having lent my influence in that direction.

With you, I have enjoyed the essay of the morning. With you, I have enjoyed the opportunity of seeing a farming town; and the best evidence of its thrift is in this, one of its public buildings, — a hall which does infinite credit to the taste and the enterprise of the citizens of Southborough; and we find evidence of the same thrift and enterprise in the beautiful homes and farms which we see about us, and which we should see to better advantage if they were not so thoroughly covered with the snow which has just fallen.

It is not for me to indulge in mere commonplaces, or to attempt to make suggestions to men who are so much more familiar with the subjects which are before this meeting than I am. There is one general suggestion which I draw from the essay of the morning, and from the opportunity which I have had, under the education of that essay, to examine the farm of Mr. Burnett, and the machinery which he has in operation there for the killing, curing, and selling of pork, for the separation of cream from milk, and for the manufacture of butter; and that general suggestion is this: that it is not of so much consequence that that particular machine should succeed, but it is of the utmost consequence to see that Mr. Burnett, a farmer, is putting intelligence and brain into the business of farming, and to see, also, the farmers of this Commonwealth coming up from all its sections, interested in the experiment as an experiment, — the application of brains and intelligence to farming; for certainly, if agriculture is taking any new start in Massachusetts, if it has any future before it, it is because, through the influence of leading men such as are gathered here, through the education coming from the Agricultural College, through the influence that is being stimulated by our agricultural farmers' clubs, through the new impetus, I am happy to say, which the new secretary of the Board is going to give to this matter, farming is going to have applied to it something

of the same intelligence, something of the same activity, something of the same invention, something of the same effort, which make other businesses successful.

I can only put these random thoughts in a random way; but, if I can in any way express the interest which Massachusetts must feel in the art of agriculture, I shall in some measure have done my duty.

Major HENRY E. ALVORD (of Easthampton). Allow me, before we adjourn for dinner, being outside of the Board, and engaged at present in other occupations besides agriculture, to express the satisfaction that I believe is felt by all present in seeing *at last* — and it certainly must be ten or a dozen years since such an event took place — the Governor of Massachusetts presiding over a country meeting of the Massachusetts Board of Agriculture. It is full time. But "all's well that ends well." And now let us hope that it will keep well, and that there will be a recognition of the fact at *some* places, and at *some* times, that there are farmers in Massachusetts.

Gov. LONG. There is one thing you can do better than that, major, and gentlemen: you must make some farmer governor.

Adjourned to two o'clock P.M.

AFTERNOON SESSION.

The Board met at two o'clock, Mr. E. F. BOWDITCH of Framingham in the chair. The first speaker was Dr. E. LEWIS STURTEVANT of South Framingham, who delivered a lecture on

THE GROWING OF CORN.

BY DR. E. LEWIS STURTEVANT.

The corn-plant is a vegetable of wonderful aptitudes. At the time of the discovery it had secured adaptations from Brazil and Chili in the south, to Canada and California in the north, and had branched out into numerous varieties. There seems to have been as great a difference between the maize of Lake Titicaca, scarcely three feet high, and ears not larger than one's finger, but closely covered with compact vitreous grains, as Squier describes it at present, and the

maize of the lower country, called *morochu* and *capia*, as at present exists between our cultivated corns, — the pop-corns, flint-corns, and dent-corns of our fields and gardens. Traditions of the ninth century in Central America speak of the yellow and white. Cartier, in 1535, describes the maize at Hochelaga, now Montreal, "as great and somewhat bigger than small peason," — a description that would apply to the Canada corn of to-day. Acosta, in 1509, describes the corn of the West Indies and the Spanish Main as "although the graine be bigg, yet find they great store thereof, so as in some clusters I have told seven hundred grains," — a mention which might describe the dent-corns of to-day. In 1620, Nov. 25, the explorers of the Pilgrims unearthed buried corn "of this year, some yellow, and some red, and others mixt with blue;" and Josselyn writes, that of the three sorts, red, yellow, and blue, the blue is commonly ripe before the others a month. It seems clear that the Indians cultivated the varieties described as King Philip, Mandan, Pueblo, Sioux, Squaw, Tuscarora, and Wyandotte, and probably sweet corns. So general, indeed, was the cultivation of corn, that it is mentioned by nearly all the early explorers, and, so far as we can gather from their writings, its general character was the same as it is now. We have hence an antiquity of culture indicated in these great variations and adaptations; and, indeed, so changed has corn become, that we do not recognize its wild progenitor, even if we have discovered it.

The practical importance of these remarks consists in the fact, that, as corn has been highly variable and has readily adapted itself to varied conditions, we shall expect the plant to be more variable in our civilized hands, and to readily conform to such demands as are intelligently made upon it. What has already been accomplished in this line may be seen by an examination of the three hundred and seven specimens I have placed on exhibition to-day. The lengths of ears vary from one inch to fourteen inches and a half; the circumferences, from two inches and three-fourths to nine inches and a half; the weight, from a quarter ounce to eighteen ounces; the number of rows, from four to forty. We also find a great variety in the colors; such as amber, flesh-colored, white, tawny, yellow, orange, coppery red, purple, blue, black, and variegated, as well as various shades

for each color named. We notice some of the cobs are red, others white, irrespective of the color of the kernels. We also make an exhibition of sports which have occurred in one variety, the Waushakum; not that such are exceptional with this variety, but only that it is from this one variety I have selected. You will notice a variation in the number of rows — six, eight, ten, and twelve rowed — and mixtures of rows, and that with the diminution of the number of rows is an increase of bulk of grain from a given length of cob; you will notice tassel-corn, branched ears, triple embryos, and unformed structures.

Notwithstanding what you here see, you can tell nothing from your seeing of the prolificacy of any one of these varieties. Some of the largest ears have come from fields which yielded but a small crop; some of the medium ears are samples of crops of one hundred bushels per acre, and more. Of the many varieties shown, you might select many fitted for this climate; and yet no one here could select the variety which would furnish the largest yield. Knowing as I do the history of some of these ears of corn, I could readily select two ears from the number, the seed from which should differ in their future product as two to one, notwithstanding the best of manure and the best of culture for each. This one word, the "history," means much. It means a pedigree; it means giving the knowledge whether our variety will repay a high culture, or not; it means the knowing the variety, which, with good culture, can be depended upon always for large crops; it means a method of improvement; it means a knowledge which avails to enable the farmer of the East to meet successfully the competition of the West and cheap freights.

Yes, gentlemen, the barbarian, the rude Indian, was enabled, either by accident or design, to secure ears of corn which were of fine quality, which belonged to many varieties, which repaid the labor which had no settled value in their economy. Of the amount of crop they raised on a given area I can find no mention; but probably each cultivator was content with the crop he received, and thought not of comparing results with his neighbor. If manure was needed, it was sought by burning the forest into ashes, or in the form of fish from the nearest stream or the sea. With

rude hoes they kept down the weeds. Their culture was clean, but involved watchful labor. How much advanced are many of our districts from this Indian method? The same description might well apply to some of the methods in vogue by some of you who are listening to my voice. The ear is selected for seed: the Indian did the same. The hills were prepared by clearing off rubbish, exposing the soil, and breaking the ground, by civilized man as well as by the Indian; the only difference being in that of implements, wherein we have an advantage. The seed is dropped and covered by the white and red man alike. Both use the hoe, or its equivalent,—the Indian woman, her moose scapula or crooked stick; the white man, the steel hoe. The Indian was content with his crop; the white farmer is content with his crop. We find no hint that the white man's crop, as raised by the settlers, exceeded that of the Indian near by who taught the European emigrant his methods.

Yet some farmers now raise each year large yields of corn in the very neighborhood in which other farmers raise but small crops. Although the average crops vary greatly in our different States,—as, in 1878, thirty-six bushels per acre for Massachusetts, and nine bushels and three-tenths for South Carolina,—yet there is but little variation between the yields gained by the best farmers in these two localities, the maximum reported crops being surprisingly alike. These facts mean something, and all investigation shows this: namely, that care and attention, intelligent action, give the large crop; routine, barbarian action, results in the small crop. Civilization commences with care in the seed used, which barbarism and civilization alike may cultivate alike.

SEED.

To the seed, then, must we look first, in order to secure improvement, in order to gain the maximum crop at the least expense. It is not enough to select the ear: this process has done something; but alone this is not sufficient, as our comparisons between ancient and modern results show. We must pay attention to the past history of our seed; we must breed our corn; we must secure prolific ancestry, and use the seeds from fecund parents.

My attention was forcibly called to the importance of the

seed in 1875, when I reported the result of an experiment (to be found in Appendix of "Agriculture of Massachusetts" of that year); the seed used appearing to the eye of equally good quality, but from different sources. The field was of like history, was manured alike with dung, and was cultivated as one field.

	Bushels shelled corn.
Seed-corn A yielded, with manure	110
Seed-corn A yielded, without manure	68
Seed-corn B yielded, with manure	55

Here the better seed yielded, without manure, more than the inferior seed with manure; and under equivalent circumstances the better seed yielded just double the crop of the inferior.

After thinking over this result, which seemed to me surprising, I concluded to attempt the forming of a seed-corn of prolific habit. I became aware that the appearance of the ear was but a secondary consideration, the past cropping of the seed being the primary. In the "Report of the Secretary of the Connecticut Board of Agriculture, 1878," will be found an essay of mine, entitled "Seed-breeding," wherein I have developed my theory, and stated my facts. In the "Agriculture of Maine, 1878–79," under the title "Seed-Corn," I have given other selections. The summary of my procedure is this: as corn has an hereditary character, I secured prolific male parentage by carefully castrating the tassels from the barren stalks in my seed-growing field, and then selected the best ears of the crop for next year's seeding. The results have been marked. I have secured prolificacy, uniformity of ear, and a heavy corn-grain.

Take a stalk of Waushakum corn at the first showing of the tassel, and cut it across at the nodes, or joints. On the five lower nodes will be found embryo ears; the largest and earliest-developed being upon the upper nodes. Now, nature has provided for five ears of corn; and although, as a rule, the upper ears have more length, and a greater number of ovules, than the lower, yet the second ear down is nearly or quite as well filled with ovules, the third somewhat inferior, the fourth shorter still, and the last one, near the ground, yet shorter. When the pollen begins to fall in the field, the

upper ear has silked, and becomes pollinated. In many cases, but not in all, the next ear throws out its silk before the pollen has ceased falling, and becomes pollinated; the next lower ear rarely silks in time, and the ones still lower very rarely secure fecundation. Now, in this variety of corn, we have secured what I may call a prolific intention. What is to be gained is the "earlying," to coin a word, of the lower ears, so that they shall develop their silk in time to receive the pollen, or else to secure a longer flow of pollen, or to cause these two conditions to approach each other. When this shall be accomplished, — and it is asking no more than the variability of the plant would seem to render possible, — in the presence of sufficient manure and proper culture, the crop will be doubled, trebled, perhaps quadrupled. Such a result can be looked for only after considerable time, and through intense competition among seed-breeders.

This year has been a peculiarly favorable one for my corn. Being planted seasonably, a couple of weeks of cool weather came on just as the pollen began to fall: this caused a prolongation of the season of pollination, and yet did not check the growth of the embryo ears to an equal degree. Consequently, more of the second ears appear in the crop than I have ever before known on the farm, and sometimes even a third ear. In order to secure this condition of the plant hereafter, I shall endeavor to save for seed for my own planting next year the second ears, hoping that these ears, which were more forward than the like situated ears on other stalks, will transmit this tendency to their progeny, and, as they were fertilized by late pollen, that the habit of the plant acting as the male will be alike transmitted.

In a neighbor's field of seventeen acres and a half, that of Mr. E. F. Bowditch, we find later planting. The cool weather came before the fall of the pollen, and delayed it. When the hot weather succeeded, the pollen fell rapidly, and occupied but a short time, and there seems to be fewer second ears in the crop than in mine. This crop shows, however, a greater prolificacy than does mine; and this brought about, unquestionably, by the seed used being the result of a cross of the year before. This observation, if

correct, as it seems to be, would show that in plants, as in animals, crossing brings about strength. The crop of 1879 was from a cross of the Longfellow and the Waushakum corn, — two seed-corns of similar appearance; this crop of 1880, from selected ears of last year's crop, and selected in the direction towards which the Waushakum corn has been bred. The seed of this year will be bred with the Waushakum corn in order to secure in this corn the good points already outlined. Except for selection, this crossing of corn would be of avail only for a single crop, and the seed thus gained would become grade instead of thorough-bred.

Having now treated of the seed, — the most difficult point to secure perfection, or even maximum yield, than any other, — we will pass to the cultivation of the crop.

PLOUGHING.

Experiments have clearly shown that the corn-roots extend the most rapidly in soil that is rich, moist, and of the proper temperature. How, in culture, can we secure these conditions?

The temperature of the soil is acquired through the surface, the heat being originally from the sun, and transmitted downward. The study of soil-temperatures in this connection is rather a difficult one, as the heat of mid-day becomes equalized in the night, and the maximum temperatures concern us, as well as the mean temperatures of the day and night. In general, the maximum temperatures during the *growing season* of the crop are near the surface, while there is a considerable uniformity of the mean temperatures at four inches, six inches, and two feet of depth. Where this maximum temperature exists, there, under the proper conditions, is the greatest growth of feeding-roots.

The moisture of the soil in early spring is general. As evaporation takes place during the growing-season, the upper portions of the soil dry first, and soon the pasture-region of the roots contains water far less than the capacity for saturation of the soil. The rains in June, July, and August, seldom are sufficient to saturate below the upper few inches of the soil; and generally, during these months, atmospheric water is retained within the upper five inches of the soil.

The richest soil, by common observation, is found to be, in general, near the surface.

The corn-plant secures its growth during the first portion of the season; the latter portion of the season being utilized in the maturation of the crop. It is during the growing-season that we must influence the crop through the conditions that we can control. Possessing these facts, we would infer that the seed-bed should be so prepared as to secure the maximum fertility, moisture, and temperature in conjunction. This, practice confirms. Hence we advocate shallow ploughing for the seed-bed, as leaving the most fertile portions near the surface, where the rains penetrate, and where the sun exerts the greatest power. The depth of ploughing may vary, perhaps, with climate; but in this latitude five inches seems amply sufficient.

A deep soil, and a permeable soil, is always desirable in order to extend the root-pasturage, and to secure to the plant greater resources against sudden or long-continued climatic changes. This can be secured by subsoiling, but more profitably by deep ploughing during the rotation preceding the corn-crop, under those limitations which are now generally understood as arising from the character of the subsoil.

HARROWING.

After the plough comes the harrow in order to smooth and pulverize the soil. Harrowing should be thorough, as stirring the soil is advantageous in opening it to atmospheric changes, and as affording the mechanical conditions favorable to the depositing of the seed. Pulverized soil also dries more quickly, and thus secures an advantage for the seed during the early season, when soil-moisture is so apt to be in excess: it also acts as a mulch to conserve the moisture in the lower strata that is so much needed a little later. Harrowing should follow the ploughing, precede the application of manure or fertilizer, and follow the application of the fertilizing elements.

FERTILIZING.

From what we have already said, it will be seen that we advocate placing our fertilizing material as near the surface as can conveniently be done. If dung be used, in good

farming it should be put on broadcast, and thoroughly harrowed, so as to incorporate and distribute through the surface portion of the soil. If fertilizer be used, we prefer broadcasting, and scratching in with a light implement; in both cases the important consideration being an even distribution throughout the upper soil. The rains then distribute the soluble ingredients to just where the roots feed to the most advantage.

The kind of fertilizer used is of little consequence, provided enough, and not too little or too much, be applied. To get the most advantage from manure for this crop necessitates considerable labor. Artificial fertilizers are never known to fail, and are cheaply and quickly applied. Let it be remembered, however, that manure is a complete fertilizer; and an artificial fertilizer intended to replace manure must also be complete. In New-England farming dependence on a phosphatic manure must never be urged: it is only a compound manure that can replace dung.

We all know the results of applying insufficient plant-food, in diminishing the crop: it is not so well known that excess of fertility tends to deteriorate the quality of the crop. It is also unprofitable to apply more manure than the crop needs in order to give its maximum yield. The quantity of manure to be used is to be governed, in part, by the condition of the soil as respects agricultural barrenness of a greater or less degree, and most particularly, in practice, by the character of the seed used. A greater application of fertilizer is profitable where seed is used capable of bearing eighty bushels of crop, than where another seed is used whose normal yield is but forty bushels of crop per acre. It is also to be governed by conditions of culture. Where thorough culture is carried out, there more manure can be profitably applied than where insufficient cultivation of the field takes place.

It seems probable, that, in almost every case, an application of a superphosphate about the roots of the plant is of advantage to the crop, and this irrespective of the quantity of manure used broadcast; the phosphoric acid seeming to act physiologically on the plant to increase the formation of root-fibres.

In my own practice I find five cords of dung per acre

sufficient, and the most profitable quantity; but this is clear dung, not diluted with muck or other worthless substance. The larger proportion of my fields are fertilized with Stockbridge manure, of which I use from six to seven or occasionally eight bags, according to the past history of the fields. The quantities used must, however, be governed by individual circumstances.

PLANTING.

The method of planting which I prefer is in drills, and this because experience confirms in my case what the average results collated from the results published in the volumes of "Agriculture of Massachusetts" indicate; viz., a slight increase of yield from drill-planted over hill-planted corn. In addition, it is cheaper to plant in drills. In all cases where the extent of land under cultivation will justify the investment, a corn-planter will be found valuable. There are many excellent ones in use in the West. These plant, cover, and press two rows at a time, as rapidly as a horse can walk. An acre an hour, or, under exceptional circumstances, fifteen or eighteen acres a day, is their capacity. When smaller areas are under culture, one of the smaller and cheaper planters can be profitably used. In many cases, the saving over hand-labor will pay for a machine the first year, to say nothing of the saving of time during the busy season of the year, and the being able to get the crop in seasonably.

Early planting, in this region, is of great advantage to the crop. When the corn grows rapidly by day, and is checked in growth by the cool night, there is an intermittent action of growth which allows of the plant elaborating the material stored during sunlight, and favorably affects its fecundity.

In experiments in this direction I have invariably found an advantage manifested of the early-planted over the later-planted crop in adjoining rows; and this undoubtedly resulting from the more variable weather to which the early plant was subjected. The customs of a neighborhood are the best guide as to the time for planting, only be careful not to be misled in the observation of whose custom to imitate. In this region, the middle of May in many seasons; in other

seasons, the last week of May, or even, occasionally, the first of June. The earliest planting allowed by the season is to be preferred.

Distance for planting must be governed by the necessities of the culture, — sufficient room between the rows for the movements of the horse. It must be also regulated by the fertility, and other agricultural conditions of the field. In a droughty field it is well to plant sparingly, as the corn-plant is a great evaporator of water, and many plants call for more water than do few plants. Water which may not be sufficient to supply 3,500 hills to the acre may be ample to supply 2,700 hills. It also requires more fertility in the land to carry a thick planting through to maturity than would be used in a thin planting. The character of the plant must also be considered, as a large, strong-growing variety will require greater space for development than will a small-growing variety.

The same principles which led me, on Waushakum Farm, to plant 6,223 hills (in drills) per acre, might lead the farmer in the South or West to plant 2,722 hills. The like reasoning and experience which leads me to use four kernels in a place might lead other farmers to use one kernel, or five: in a word, there can be no unvarying rule. We should plant in the way best fitted to meet the circumstances of our position.

I plant in drills three feet and a half, hills in drills two feet apart, four kernels in a place. This gives 6,223 hills, or 24,892 kernels, per acre. In careful experiment I have found increase of crop to follow increased thickness of planting up to 45,000 kernels per acre; but the necessities of farm culture and profit confine me to the number used, viz., 25,000.

The depth of planting must necessarily vary with conditions. In the extreme south-west the Indians punch a hole eighteen inches deep with a stick hardened in the fire, and, enclosing the kernel of corn in a ball of moist mud, they drop it to the bottom, and punch it down with a stick. They do this in order to get moisture, and in that climate the temperature is sufficiently high at that depth of earth: they also secure apposition of the earth with the seed. We must secure the like conditions: we must have moisture,

heat, and contact of earth with the seed. In this region about an inch and a half to two inches fulfils these conditions in part, and pressure with the hoe or the machine completes. This statement illustrates how the same principles may be secured in different ways, and brings out the facts of the essentials which are to be secured.

CULTIVATION.

As soon as the corn has arrived at a height of about six inches, if planted with a machine at uniform depth, it is a good plan to run a light smoothing-harrow over the field. This eradicates all the newly sprouted seeds of weeds, if done on a hot day, and combs through the more deeply rooted corn without accomplishing any material damage. When the corn reaches a foot in height, it is well to commence cultivation with a horse-hoe, and hereafter to go through the field with this implement as frequently as other farm duties will allow, but never less than three times. In using the horse-hoe, the design should be to go as deeply as possible, and as near the corn-plant as can be without uprooting it.

The object of cultivation is threefold, — the checking leaf-growth on the plant, the controlling the moisture in the field, the eradication of weeds.

The first object is the one I have heretofore given the name of "root-pruning," and concerns the plant. The law of compensation of growth, first propounded by Goethe and Geoffrey St. Hilaire, seems to apply here, whereby, when much organized matter is used in building up some one part, some other part becomes starved: otherwise expressed, excess of foliage is followed by a diminution of grain. Now, the farmer desires, through the application of manure, to secure the greatest vigor of growth. This vigor may be expressed in leaf-growth, which in excess is injurious. If, now, the farmer can check this manifestation, and change this vigor towards fruitage, he is securing a great advantage. By using the cultivator to break the fibres of the growing crop, under proper conditions, a check is produced in the leaf-growth of the plant, and the plant is reminded, so to speak, that its purpose is to grow grain. The vigor is in the end not disturbed, because the act of breaking one root causes

numerous others to form; and in two or three days there is a greater provision of roots for feeding than there was before the cutting. These facts, which I have elaborated elsewhere, lead us, as verified by experience, to the following rule: Force the plant to the utmost vigor of growth, and then keep checking the growth as it is seen to be excessive. When the plant is seen to be growing rapidly, run the cultivator, and stop this growth: as soon as the plant secures rampant growth again, use the cultivator again, and this until the plant flowers, *but not later*. By this means a succession of growth-impluses are given to the plant, and increased prolificacy is the result.

This method of action is more available for high culture than low culture; is better befitting the good farmer's than the poor farmer's practice; is most available where the greatest luxuriance of growth has been secured.

The second object of cultivation is controlling the moisture of the field. When earth is pulverized, the tendency is for this fine soil to dry rapidly during and after the operation, on account of the exposure of its particles to the atmosphere, and on account of breaking the capillary connections with the soil underneath: hence, if the soil is too wet, cultivate in order to dry it. On the other hand, dry pulverized earth is a non-conductor of moisture; and hence a layer of pulverized earth resting in a disturbed condition upon the lower layer of the soil serves as a mulch, and conserves the water in the lower layers of the field, preserving it, in a degree, from evaporation: hence, cultivate in a drought in order to economize the water in the soil.

We have the following rule: cultivate deeply in a wet season in order to dry the land the most possible; in a drought, cultivate shallow in order to secure a fine mulch on the surface. On account of the importance of these statements we fortify them by quoting Professor Stockbridge's experiments with boxes of a cubic foot capacity, filled with soil without disturbing the position of its particles or strata, and taken from fields under cultivation with corn. The experiment extended through seven days (from June 26 to July 4), the weather very warm. The water lost per acre was as follows: —

	Clay Soil.	Light Soil.	Heavy Loam.
Hoed	904 bbls.	542 bbls.	1,106 bbls.
Unhoed	1,170 "	1,276 "	1,329 "

This shows the efficacy of cultivation in preserving water to the crops during a drought, the upper surface alone being stirred.

When the land was pulverized deeply in the boxes, the soil being previously saturated with water, the results were different. Thus, the first day, was lost, —

	Clay Soil.	Light Soil.	Heavy Loam.
Tilled	1 lb. 3 oz.	1 lb. 3 oz.	1 lb. 14 oz.
Untilled	4 "	10 "	–

And this shows the efficacy of cultivation in drying soil, through its effect on the evaporation of water.

The third object is the destruction of weeds. This is so self-evident, that it has for a long time diverted attention from the other and more important objects we have mentioned.

In general, then, cultivation must be carried out thoroughly, efficiently, and *judiciously* in order to secure the maximum results on the crop. The horse-hoe is superior to the hand-hoe, as being under greater control, being enabled to go shallow or deep according to the exigency of the crop or the judgment of the farmer. It is again far more economical; and experience has also shown that it is sufficiently efficacious for all the eradication of weeds required for the profitable growing of corn.

CORN-STOVER.

This is the corn-plant after the ripening and removal of the grain. Its value to the farmer as a forage-crop is dependent upon a variety of conditions. If allowed to stand in the fields, exposed for a long time to the autumnal rains, much of its goodness is washed from it, or the more valuable

carbo-hydrates become transformed into woody fibre. If cut and stooked early, and removed under cover, it has a considerable value. In one experiment in the winter of 1878, my whole herd of cows were fed upon it almost exclusively. As near as I could calculate, for every ten tons of corn-stover fed I was enabled to sell six tons of hay. The cattle came through the winter in fair condition, but not quite as smooth-haired as suited my æsthetic taste. The milk-yield per cow for my whole herd was, —

	QUARTS.
9 cows, 1875	1,901
9 cows, 1877	2,466
9 cows, 1878	2,160
13 cows, 1879	1,903

As the farm-year commences with Jan. 1, the effect in the milk-yield must be looked for in the two years 1878 and 1879. The falling-off from 1877 was then 435 quarts per cow. This does not, however, tell the whole story, for in milk-yield no two years are alike; and often, from no assignable cause except period of coming into milk, there will be greater variation than here given; as in 1875, when, under full feed, the yield was 1,901 quarts per cow.

From these figures I can state that my corn-stover was worth to me in 1878 six-tenths the value of hay in cash, less the loss of milk, if any, caused by substituting stover for hay. As I sold my hay for an average of $22 in the barn, this made the corn-stover stand me in at $13.20 a ton.

The product per acre varies with the closeness of the planting. With my system I rarely obtain less than four tons per acre, or the equivalent of two tons and four-tenths of English hay. There is no question, hence, in my mind, but that the corn-stover is ample compensation for the money expended for fertilizers.

According to Wolff's tables, —

	Water.	Albuminoids.	Carbo-Hydrates, etc.	Crude Fibre.	Fat.	Ash.
Maize-straw	14.0	3.0	39.0	40.0	1.1	4.0
Meadow hay	14.3	8.2	41.3	30.0	2.0	6.2

And it is but fair to say that these analyses do not seem to carry out the proportionate values as shown by my feeding experiment.

The value of the stover is principally in the leaves and sheaths. Where corn is "topped," there is a loss of the lower leaves, and no corresponding gain, so far as I can determine. Indeed, topping corn seems wasteful of the fodder, as it also seems wasteful of labor; and yet in this region this practice seems quite universal.

HARVESTING.

In the autumn the corn-plant is prepared for the husking in one of two ways. It is either "topped," or "stooked." Topping consists in removing the tassel and leaf-growth above the ear, and takes place earlier in the season than the stooking. There seems no reason why it should not be done immediately after the fall of the pollen, and undoubtedly at this time furnishes the best quality of fodder to be obtained by this system. Its advantages are supposed to consist in exposing the ear to the sun, and the removal of the part which is now supposed to be useless and to require nourishment. This view of the case seems to me to be in general erroneous. If the corn is belated, and is not ripening sufficiently fast to secure itself from the dangers of frost, then, perhaps, topping is justifiable; but ordinarily the season is long enough for the hardening of the grain without this questionable expedient. As to the second reason, it can be fairly said, that, after the formation of the kernel, the growth-period has passed, and the influence of the leafage, and green portion cut away in the topping, is rather to aid in the transformation of the juices into grain material than to abstract from the plant for its own growth.

Stooking seems to be the preferable way of harvesting, as saving the corn in good condition, allowing of its hardening and drying, and preserving the fodder in good condition for feeding; but the ear should be husked early, and the stover carried under cover, in order to secure the best results.

The expense of stooking varies with the method of planting. It costs somewhat more to stook from drills than in hills partly as being less conveniently cut, and in part from

the greater number of stalks. A good average day's work in stooking from drills is about half an acre a day per man, or, as two men must work together for the most economy, an acre a day for two men; but the amount of work varies considerably in different fields and under varied circumstances.

HUSKING.

The cost of husking is quite a tax upon the farmer. With our Eastern corn thirty bushels of ears a day must be considered a good day's work. This labor can, however, be often done by children, women, and incapables, or, in other words, by those who cannot earn a full day's wages at other work. I find it preferable to husk from the stook in the field, and each afternoon to bin the corn husked during the day, and to store away the stover. From eight to ten cents a bushel of shelled corn is a fair estimate of the cost at present for the grain, and about a day's labor for three men and two horses per acre to take care of the stover and binning.

CROWS.

A word now on the bird enemies. The crow in the spring is a veritable nuisance. He must be kept off by the use of various scarecrows, of which the best seems to be a dead crow suspended from the summit of a sloping stick. Some people find advantage in rolling the seed in tar, and then drying off in plaster: this is an efficient way, but unfits the seed for use in a planter. Crows about me get accustomed to the various scares; and each year, for security's sake, a new one must be invented. A string passed around and over the field, and elevated on sticks, is as good as any, but some years is of no effect. Bright tin dangling in the air, newspapers opened, and spread about the field anchored with a stone, a stuffed effigy of a man, a clapping windmill, etc., are often used with effect; but oftentimes no single one is of any avail. A neighbor calls my attention to the fact that crows are less troublesome in the early than the late season, and claims that early planting entirely obviates the necessity of scaring off the crow. There is some truth in this, and it is well worthy of consideration.

Blackbirds seldom trouble me; but once, at least, they in one morning destroyed every exposed tip of corn in a field

of several acres, just preceding the time to stook. I know of no available remedy, and, unless more troublesome than at present, their depredations scarcely require to be guarded against.

The cornfield is in this region little subject to loss through bird or insect foe, and this is a very satisfactory thing to the grower. If such depredations occur, they seem confined to exceptional years or exceptional circumstances.

SUMMARY.

The summary of rules for securing large and profitable crops of corn seems to be, —

1. Seed of a prolific variety.
2. Shallow ploughing and deep pulverization.
3. Surface-manuring, and sufficient, but not overmuch, manure.
4. Thick planting; early planting.
5. Thorough and judicious cultivation, carried out with horse labor.

To be avoided, —

1. Poor or unknown seed.
2. Insufficient or overmuch manure.
3. Hand labor.

I now propose to give some statistics of successful crops grown in Framingham this year.

B. T. Manson, Framingham, Mass.

Size of field	2.88 acres
Yield, grain	452 baskets, or 78½ bushels, per acre.
Tops and suckers . . .	2 tons per acre.

	Cost.	
	Hours of Horse.	Hours of Man.
Ploughing	40	20
Harrowing, etc.	20	10
Hauling and spreading dung	50	50
Marking and planting	–	45
Cultivating, twice	20	20
Topping	–	30
Storing fodder	20	50
Total	150	225

Calling horse labor half man labor, and man labor a dollar and a half a day, —

COST (*per Acre*).

For labor	$15.62
Half dung, at $8.00 a cord	34.72
Husking 78½ bushels at 10 cents	7.85
Total cost per acre	$58.19

CREDIT.

2 tons tops, etc., at $8.00	$16.00
Cost of 78½ bushels corn	42.19
Cost per bushel	53.6

Hills, three by three feet; kernels in a hill, four to five.

Waushakum Farm, South Framingham, Crop, 1880.

As there has been no separate account kept with the field for labor this year, I content myself with figuring the labor the same as the last year and preceding years.

	Per Acre.		Cost.
	Hours of Horse.	Hours of Man.	
Labor, to harvest	23	28	$5 92
(*Average for five years*)	(*23*)	(*25*)	(*5 47*)
Cutting and stooking	–	17	2 55
Harvesting and binning	20	20	4 50
Total labor	43	65	$12 97
Six bags Stockbridge corn-fertilizer at $4.50,	–	–	27 00
Husking, five cents a basket	–	–	8 20
Total cost per acre	–	–	$48 17
CREDIT.			
Four tons stover at $8.00	–	–	32 00
Leaving cost of 164 baskets, or 82 bush. grain,	–	–	$16 17
Or per bushel	–	–	19¾

Hills two feet, in drills three feet and a half; kernels in a hill, four; size of field, 7.06 acres.

E. F. Bowditch, "Millwood," Framingham, Mass.

($17\frac{7}{16}$ acres of corn, surveyed by C. J. Frost.)

	Total Cost.	Per Acre.
Labor to harvest	$98 85	$5 67
Labor to stooking	60 00	3 44
Labor to harvesting, etc.	234 07	13 43
Total labor	$392 92	$22 54
138 bags Stockbridge fertilizer	579 90	33 27
Total cost	$972 82	$55 81
CREDIT.		
$52\frac{32}{100}$ tons stover at $8.00	408 56	23 44
Cost of 3,474 baskets ear-corn	$564 26	–

Cost of $199\frac{1}{3}$ baskets of ears, per acre . .	$32.37
Cost shelled corn, $99\frac{6}{10}$ bushels per acre . .	$32\frac{1}{2}$ cents per bushel.

In order to show the difference between hand labor and machine labor, and between manure and fertilizer, it may be well to compare these three crops, bringing the figures to the same basis. We have, then, —

	MR. MANSON. 2.8 Acres.	STURTEVANT BROTHERS. 7.06 Acres.	MR. BOWDITCH. 17.43 Acres.
Labor, per acre	$15 62	$12 97	$12 56
Husking	7 85	8 20	9 98
Dung, half charged	34 72	–	–
Fertilizer, all charged	–	27 00	33 27
Total cost	$58 19	$48 17	$55 81
CREDIT.			
Tops and suckers	16 00	–	–
Stover	–	32 00	23 44
	$42 19	$16 17	$32 37

Cost of $78\frac{1}{2}$ bushels (Manson) . . .	$42.19 or 53.6 cts. per bushel.
Cost of 82 bushels (Sturtevant) . .	16.17 or $19\frac{3}{4}$ cts. per bushel.
Cost of 99.6 bushels (Bowditch) . .	32.37 or $32\frac{1}{2}$ cts. per bushel.

We note in these figures that one bag of Stockbridge corn manure gave Mr. Bowditch twelve bushels and a half shelled

corn, and Sturtevant Brothers thirteen bushels and a half shelled corn, gross yield. Each cord of dung used by Mr. Manson gave nine bushels shelled corn, gross yield.

We further note a wide variation in the yield of stover. Mr. Bowditch's stover was determined by weighing, and then allowing for the probable moisture. Sturtevant Brothers' was obtained by estimate, — a hundred pounds of fodder to the bushel of shelled corn, the odd figures being thrown against the crop. Mr. Manson's figures are an estimate of tops, etc., removed. I cannot but think that the figures are practically correct, and probably rather under than over the actual amounts harvested. As a rule, the stover is decreased with increase of grain-yield, and large yielding fields show less stover per bushel of grain than do fields of small yield.

If there is one point which is prominently emphasized to those who know the conditions under which these three crops are grown, it is that of the great efficacy of cultivation. I have never seen severer root-pruning than was accomplished by Mr. Bowditch. Sturtevant Brothers' field had less, and Mr. Manson's still less. The amount of fertilizing material applied was greatest in the case of the smallest crop; the amount of cultivation, and its severity, so to speak, the greatest in the field of the largest yield. Indeed, these three crops all bear out the statements and reasonings given in this paper.

Question. In estimating the worth of your crop, you take into account the fodder, do you not? Can you raise corn, throwing away the fodder, as cheap as the Western farmer?

Dr. Sturtevant. There is a great misapprehension in regard to the value of corn-fodder. What do you want to throw away the fodder for? You might just as well ask the Western farmer to throw away half his crops, so as to reduce the average. The value of corn-stubble seems to depend a great deal upon the circumstances of its preparation. If cut early, and put under cover before it is washed by the rains after it is cut, it is really of great value. I value corn-stubble, by actual experiment on a large scale, when it is put in in the way I speak of, as equal to six-tenths the price of hay. In other words, when we can sell our hay, as I have,

at an average of twenty-two dollars a ton, my corn-stubble has brought me, in cash, thirteen dollars and twenty cents a ton. I get four tons to the acre.

QUESTION. Then your stover is worth more than your corn?

Dr. STURTEVANT. No, sir: I do not figure it so. I only say, under those circumstances. This year my stubble is not worth that, because I could not get the labor I wanted, and left it in the field longer than I should. It was washed somewhat by the rains. How much it was damaged, I shall not know until I come to feed it; but I put it this year as equal to about one-half the value of ordinary hay. I know there is corn-stubble in my neighborhood that I would not give three dollars a ton for, delivered, for its real value for feeding. But corn-stover, when rightly prepared, rightly treated, will usually pay for the fertilizer or manure used on the crop, or just about that.

QUESTION. What time do you cut it up?

Dr. STURTEVANT. As soon as the corn is glazed. I have never cut too early yet. Every year I cut a little earlier than the year before.

QUESTION. Do you consider that the freezing of corn-fodder, as it stands, is a great injury to it?

Dr. STURTEVANT. The moisture of it is an injury, and the freezing of the moisture seems to hurt it. If you give corn-stover overhead protection, I don't consider that it would be injured much by being exposed on the side to cold and damp; but I don't know that.

QUESTION. I mean freezing in the field, before we cut it.

Dr. STURTEVANT. I have always understood that it is a great injury, but I don't really know. I always cut before the frosts.

QUESTION. How do you treat your corn-fodder after it is put into the barn?

Dr. STURTEVANT. Feed it right out to the cattle, regularly, without cutting.

QUESTION. Do you put it in all together in one body, or set it up?

Dr. STURTEVANT. I simply put it in wherever I have space. When I get crowded, I pile it up; but I prefer to stow it rather loose. I put it in always the day it is husked.

I husk it in the field, and each day it is carried into the barn at night.

Mr. Grinnell. Are you satisfied it is better to cut up corn, or top it?

Dr. Sturtevant. I cannot see any gain in topping it, and I see a great expense. The leaf is the most valuable part of corn. When you top corn, you abandon the most valuable part to the atmosphere, to be destroyed. I know others differ from me in that, and I expect that there will be a difference of opinion about it, because it is one of those things in regard to which it is pretty difficult to prove a knowledge, and I only give it as an opinion.

Question. In your experiments in regard to temperature, at how low temperature have you found corn to germinate?

Dr. Sturtevant. I have forgotten that. I think the German experimenters state it to be forty-two or forty-three. I know that my rule in planting is, when the strata at the depth we plant gets about fifty degrees, it is about time to plant, whether it is the first of June or middle of May.

Question. Do you think corn-fodder is worth enough more after cutting to pay for the expense of cutting?

Dr. Sturtevant. What do you mean by "cutting"?

Question. Do the cattle eat more of it, eat it up cleaner?

Dr. Sturtevant. In my own stable I have tried some experiments, and I can give you the results definitely. The part rejected by my cows is, in round numbers, ten per cent of the weight. The question is, whether it will pay to cut ten tons to make a cow eat one, and that one — the part which has, by analysis, very little value — light as vanity. I do not think it will. It looks very heavy in bulk, but there is very little weight to it. I would not believe myself, until I repeated the experiment, how very light it was. When you see how much, apparently, is wasted, you do not realize, until you weigh it, how light it is in proportion to its bulk.

Question. Will you give us the cause of smut in corn?

Dr. Sturtevant. I think it is a true plant. In an interesting essay on smut, in the "Transactions of the New-York State Agricultural Society," it is stated that the corn-smut grows from seed up in and through the plant, and I know of no facts which are contradictory of this statement.

In other words, the appearance of smut in our fields comes from having smut in our seed. How to get smut out of your seed is a pretty difficult question to answer; because you must remember, that, if there should be smut on one ear of your corn-plant, the branches of the smut-plant extend down through the plant, and up through the ear; and the probability is, that the clean-looking and perfect ear that you throw into the bin, while the smutty ear is thrown away, contains the smut-plant in it, all ready to grow when it is planted. That is the probability in every case; so there is great difficulty in eliminating it: yet they are getting rid of it in some places. Under favorable conditions of succulence and growth, and a muggy temperature, smut will spread sometimes with great rapidity, and do a great deal of damage; and under other conditions it does not appear: but, if it is in your seed, you are apt to suffer every time the conditions are favorable to smut.

Major EMERY (of Lowell). If you plant corn on a piece of land that has just been broken up, you do not find as much smutty corn there as on land that has been under cultivation for several years. I noticed that very particularly this year. We planted a piece of land that was broken up last spring, and I do not know that there was a smutty ear in the crop. We had another piece that was planted with corn last year, and in the crop on that piece there were a good many smutty ears. The seed was all from one lot, and the conditions were the same on both pieces. I attributed it to the fact that the land had been cultivated.

Dr. STURTEVANT. There is a very curious thing about smut: it appears to be developed at a broken spot. I am not familiar enough with fungi to say definitely these things are so: I only give the seeming fact. I have been experimenting a good deal in relation to plants, and I find I am more apt to have smut where I have broken fibres of the plant than under other circumstances. It appears that smut simply passes up through the plant in its growth, and develops at that point because there is an opening for it. Take it under favorable circumstances, — a moist, muggy atmosphere, — and let a sharp wind go through your field, and you will find an increase of smut a few weeks later, and the smut will come upon the broken leaves and stalks more generally than upon the ear.

QUESTION. At what season of the year would you plough land for corn?

Dr. STURTEVANT. I rather prefer, on many accounts, fall ploughing; but then there are reasons why I prefer spring ploughing in this locality: so that I always feel rather undecided in my own mind. Take it in an open, dry winter, when I see clouds of dust flying off of my land, I wish I had delayed my ploughing until spring.

Capt. MOORE. I would like to ask the doctor if he regards smut as a fungus.

Dr. STURTEVANT. I regard it as belonging to the fungi class. But, as I said before, I am only quoting when I talk about fungus. I know nothing about it practically as a study.

Capt. MOORE. Then, if I understand you right, you say, that, when you have smut on the plant or on the ear, it develops through that plant down, and up into another ear that is sound.

Dr. STURTEVANT. What I mean to say is, that this theory of the smut-plant is, that it grows up through the plant, and permeates the plant to the point where it develops itself. In every case where it has been looked for, it has been found that the mycelium exists in every part of the plant, not recognizable by the eye, being too minute, but only to be seen on careful investigation; so that, if you find a smutty ear on a plant, it is wisdom not to keep any other ear upon that plant for seed purposes.

Capt. MOORE. I wanted to see if I understood you right. I understood you, and I think the audience did, in this way: that the smut, being developed on the upper ear that you had there, travels down, through, and up into a higher ear.

Dr. STURTEVANT. No, sir: it travels up, and it takes the lower ear first.

Capt. MOORE. Do you mean that the smut-plant goes into the kernel, and is there stored up, and develops smut next year?

Dr. STURTEVANT. So it is stated by the best authorities.

Capt. MOORE. I want some proof of it, if you have any.

Dr. STURTEVANT. I have no definite proof. I only know that a smutty ear will bring more smut in the product than a carefully selected ear.

Mr. ——. I notice, in examining the reports from different

parts of the Commonwealth, that the estimates of the costs of producing corn differ from twenty cents to a dollar. Now, we are told by chemists, that there are but three elements taken out of the soil, — nitrogen, potash, and phosphoric acid. I should like to inquire just how much of those elements one bushel of shelled corn and its stover will take from the soil, and what it will cost the farmer, at present prices, to replace those elements in the soil?

Dr. STURTEVANT. I could answer that question very easily by turning to a table of analyses; but I do not carry the figures in my mind. But I can give you some statistics of actual cost, if you like, upon the blackboard, and then you can remember them.

	PER ACRE.
Labor and harvesting	$12 56
Husking (ten cents a bushel)	9 98
Stockbridge manure	33 27
	$55 81

This is the account of Mr. Bowditch's field, including labor at a dollar and a half a day charged for the men, and seventy-five cents a day charged for each horse. The credit to be taken out of that is the stover, at eight dollars a ton, $23.44; leaving the cost for a hundred bushels of corn, $32.37, or thirty-two cents and a half a bushel.

Mr. ——. That does not meet my point. The question is, whether that $33.27 worth of Stockbridge manure has replaced all the essential elements taken from the soil by the hundred bushels of corn. When a man tells me that I can raise corn for twenty cents a bushel, I want to know whether I can go into the market, and buy the essential elements, and put them back into the ground for twenty cents.

Dr. STURTEVANT. If you will force me to advertise the Stockbridge manures, I can answer the question; but I don't want to advertise any thing here. Deduct the stover, $23.44, from the cost of the manure, $33.27, and you have the balance, $8.93. You can do it. The question answers itself. But I am not here to advertise any fertilizer manufacturer, and I want to keep as free from it as I can. The land has probably gained by it.

Mr. ——. Have you continued the system long enough to prove that to be the fact in practical agriculture?

Dr. Sturtevant. I have demonstrated it, by an experiment continued for five years, on a field of eight acres; and the land improved under my hand, and gave me four tons of Hungarian grass, this year, per acre.

Question. Have you ever tried Stockbridge manure on heavy soil?

Dr. Sturtevant. No, sir: my soil is light soil. The experience of our farmers who have used it on heavy soil is, that it has value; and on light soils the report is, that it is also valuable.

Mr. L. H. Chamberlain (of West Brookfield). I would like to say a word in regard to the application of fertilizers, in answer to the gentleman who put the question. There is a gentleman in Worcester who took an old piece of light pasture-land to make an experiment, put thirty-five dollars' worth of Stockbridge fertilizer on the field, and planted with corn, and he raised sixty-seven bushels and a half of shelled corn to the acre. The next year, he applied just the same quantity, and raised eighty-two bushels of shelled corn to the acre. The third year, he applied the same quantity, and raised eighty-two bushels and a half. This last year, he sowed it with oats, and seeded down. He had a very heavy crop of oats, and he says he has got as good a field of grass as ever grew on his place. He says he shall mow that piece of ground for four years in succession, if he lives, without any fertilizer whatever, no matter whether it yields two hundred pounds to the acre, or two tons.

Mr. Williams. As I understand the doctor, he says he cuts his corn-fodder just after the ear is glazed. The question I wish to ask is, What effect would it have upon the grain, provided you cut it before it was glazed? Or, perhaps, I might put it in this form: I want to know the power of development of the grain in the stalk after it has been cut.

Dr. Sturtevant. The development of the grain in the stalk depends upon the motion of the juice of the plant, and the acquisition of carbonic acid from the air. The corn-leaf, in its natural condition, takes these products from the air, and transforms them into carbon-hydrates, which are transferred by the changes in the plant to the grain. The corn acts by its own laws of growth, and all these processes stop whenever the leaf wilts; so that these transferences cannot then take

place from new material. Now, in reply to the question, experimentally, where you can keep the leaf in condition for absorbing and furnishing the moisture in transferring nutriment, you can ripen the corn from the material already stored in the stalk, as soon as you can detect a thorough formation of the true corn grain. But, in the condition of practice, the leaf wilts, these operations stop, and it will be unsafe to cut corn before you see evidences of ripening in the grain itself, before a large part of this process of transference has taken place.

Mr. ——. The doctor is an advocate for planting corn. I want to learn something about it. Will he be kind enough to state to us the character of his soil, the amount of fertilizer he uses, and the amount of crop he aims to raise, that we may judge ourselves in regard to his practice.

Dr. STURTEVANT. The amount of crop I "aim to raise" is two hundred bushels to the acre: but I cannot do it. My soil is good corn-soil. It is a light, gravelly loam, varying in thickness, in almost every place where I turn it up, from four inches or three inches, in some places, to six, eight, nine, ten inches of good brown loam, overlying an uneven stratum of light loam, which may vary from a few inches to a foot or two or more; and, underneath, a pure gravel, which allows water to pass through with the utmost readiness in any season. It is what I call a good type of first-quality light soil. The corn is planted in drills three and a half feet apart, two feet apart in the hills, four kernels in a hill; giving, provided every thing works properly, about twenty-five thousand kernels to the acre.

My ploughing I do according to convenience, — some of it occasionally in the fall, oftener in the spring. I plough as early as I can. The land is then harrowed. The fertilizer is strewn upon the surface broadcast, and then harrowed in, — usually with a light harrow. Then comes the planting; when the corn is up about six inches, I take a Thomas smoothing-harrow, and rake that land over, and that destroys every germinating seed, and breaks down the corn a little. It looks like pretty harsh treatment; but the next day or two you will find a clean field, and the corn up just the same as ever. Then I wait until the corn has a good, strong, vigorous growth. It may look about a foot high, and meas-

ure a foot and a half, or two feet. And let me tell you, gentlemen, that, if you go by looks, you will often find yourselves mistaken. A great many times, when it appears to be a foot high, it will really be two feet high. I then put the cultivator in, and run as close to the plant as possible without upturning it, and go as deep as a horse can draw; and from that time, until the period of bloom, you cannot cultivate too often. Give the plant time to start into vigorous growth, and then cultivate again. If you are cultivating for a theoretical crop, you want to follow the indications. But we cannot always follow up our preaching, and I do not follow the indications as much as I should; but I cultivate as often as I can, without regard to the plant, knowing it can do it no harm.

QUESTION. How deep do you cultivate the soil?

Dr. STURTEVANT. I think I get down four inches, as a rule.

Mr. SLADE. Do you practise cutting out the barren stalks?

Dr. STURTEVANT. Yes, and no: it is one of those things which it is very easy to tell about, and very hard to do. Two years ago the corn bloomed so evenly, that we could go in and cut out the barren stalks, and did do it thoroughly. We took off every barren stalk. In regard to suckers, I think a good deal depends upon the variety of corn. With my own variety I have never been troubled with suckers. I have never seen the time when I cared to have the suckers taken out; but I have heard of varieties of corn where a good deal of suckering would be an advantage. Out West they grow a variety of corn (I have forgotten the name of it) which is notorious for the number of its suckers: it forms a regular bush. You will find that one variety of seed-corn will have a stronger tendency to sucker than another. I can imagine these suckers being injurious; but I have never seen them so in my experience.

QUESTION. Is it not a fact, that, the thicker you plant, the less suckers there are?

Dr. STURTEVANT. I should hardly be willing to give an opinion on that subject.

The CHAIRMAN. Gentlemen, the subject of corn is now open for discussion. The Board have decided, as our time

is rather short, that each speaker shall be limited to ten minutes or thereabouts.

Mr. ——. I merely rise to say, that, two years ago, I planted fourteen acres of corn, — seven acres of it high ground, and light, sandy soil, with porous ground underneath; the rest was heavy, stiff soil. On the heavy, stiff soil, the corn was very smutty. I never saw smut more abundant than it was on that field. On the light land, not five rods from that, there was no smut at all. The smut question having come up here, I thought this fact might be an interesting one to know. I do not know any thing about smut: only I know that experience occurred to me.

Dr. Wakefield. We have had a wonderful exhibition of corn here, and we have had the report of a committee awarding certain premiums. Now, I want to know what practical lessons we are going to draw from them. I would like to know, for instance, these facts in regard to the corn that obtained the first premium, — what the seed was, how it was cultivated, how it was manured. It seems to me that, in order for us to get the most practical benefit, these points must be stated at some time by the individuals who have exhibited the specimens and raised them, or, if they are not here to do that, we must obtain them from the report of the secretary. If any exhibiter is here, it seems to me he ought to tell us how his corn was cultivated, what the seed was, when it was planted, how long it took to grow, and how it was manured: these are the points we want to know in order to derive the most practical benefit, and that is what we are here for. We are here, as practical farmers, in order to learn the best results from these experiments. The societies have offered liberal premiums, and we want to draw the best conclusions we can from them. Now, can we get this information from the gentlemen who are here, or must we wait until we get the report of the secretary?

Capt. Moore. In answer to what the gentleman has said, I will say simply this, that the Board of Agriculture had nothing whatever to do with the offer of those premiums. The conditions, if there were any, were prescribed by the parties who furnished the money: the Board had no control over that matter. I agree with the gentleman in his views precisely, that the award of those premiums is not

worth a snap, unless we know the conditions. We are not responsible for that. I do not know how we can get them, unless they are furnished by the Southborough Club, or by the individual exhibiters.

Dr. WAKEFIELD. I understand some of the exhibiters are here; and, if they are willing to give us the facts, we are willing to hear them. I do not think we have any claim upon them, because it is not a Board matter, but somebody's else. We want all the information we can get: and, if they will give it to us, we shall be very thankful; if they will not, we cannot help it.

Professor STOCKBRIDGE. I agree with Dr. Wakefield; but there is another matter which it seems to me should come first, that is of the very greatest importance, and that is this, — that the chairman of the committee should take those premium samples to the platform, and exhibit them to us, and tell us why those samples should have the premiums, rather than the other samples which we see around the hall. Then Dr. Wakefield's inquiries can be answered afterwards.

The CHAIRMAN. That seems to be the general wish of the meeting, and I will ask the chairman of that committee to come forward and tell us about that matter.

Mr. SLADE. The committee, in awarding these premiums, started with what they considered a perfect ideal ear of corn. We selected such ears as we considered perfect. The ideas of other gentlemen may differ from ours in that regard. I do not say that they were perfect; but they seemed to us to be perfect ideals of ears.

Major ALVORD. Will the gentleman go further, and give us his points in judging corn? What makes a perfect ear?

Mr. SLADE. I will simply say that I have looked these exhibits over pretty thoroughly, and I have not found what I consider a perfect ear on exhibition; but still there are ears approximating the ideal perfect ear. The committee agreed, I believe, unanimously, in their idea of a perfect ear. It is an ear medium in size as regards the diameter; the kernels are deep; the cob is small at the butt; and the ear holds its bigness towards the point until very near the tapering-off. It should be capped over; and the kernels should hold their bigness towards the point, and at the butt run out

straight, and not crinkle. You will find that the specimen that received the first premium comes nearer to this description than the others.

Major EMERY. I think we are asking too much of that committee. I have been on a great many committees where it has been very hard to decide; and I think it is hardly fair to the committee to bring up that corn before this congregation, and ask, then, to criticise their judgment. Therefore I would move that that matter be laid upon the table.

This motion was carried without objection.

Mr. HAPGOOD (of Shrewsbury). I have exhibited some samples of corn, to which the officers of this society have very kindly given a very prominent position. The land on which that corn was grown was a clay loam, very good land. It was planted on the last day of May and the first day of June. It was dressed with eight cords of stable manure to the acre,—equal to about twenty-five two-horse loads of manure. The corn came up in due time: and, when it was about a foot high, I had it cultivated with a Boston horse-hoe; for the five or seven toothed wood-cultivator is no friend of mine. I had one of them, and I threw it away. It slides over the soil, and does not go deep enough for my purpose. I cultivated it both ways when it was a foot high, twice in the row, and then it stood until the corn was two feet and eight or ten inches high; then I cultivated it once one way, twice in the row, and hoed it once: and that is all the cultivation there was of the crop.

QUESTION. How much did you get?

Mr. HAPGOOD. Eighty-five bushels of shelled corn to the acre.

QUESTION. What distance apart did you plant?

Mr. HAPGOOD. I intended to plant in rows three and a half by three feet, but by some means they were about three and a half by three and a half this year; but that did not make any difference in the crop, or but very little. The corn that I raise grows nine or ten feet high, and I don't expect but one ear to a stalk. If I can grow three ears to a hill, I shall have eighty bushels of corn to the acre. Three ears of my corn to a hill, each ear thirteen or fourteen inches long, will make eighty bushels to the acre.

QUESTION. What is the variety of corn?

Mr. HAPGOOD. It is a variety I introduced myself. I am a very modest man, you see. I do not rely upon twin-ears at all. I saw in the "Country Gentleman" a report of a discussion on the corn question in Pennsylvania, and there was one member of the club who exhibited an ear of corn fifteen inches long. It was a wonder to all who saw it, and he was questioned very particularly in regard to the mode of cultivation. If he had told the story without exhibiting the corn, nobody would have believed it, probably; but there was the corn, and they could measure it. In the course of his remarks, he stated to the audience that he regarded twin-ears as of no account. If he could grow one ear on a stalk, that was sufficient for him, and he should never be satisfied with his corn-crop until he could grow a bushel of corn on a rod of land. Well, I agree with him, from my experience, that it is possible to grow a bushel of corn on a rod of land; but I do not think it is economy. I think it better to take two acres of land and grow a bushel of corn on every two rods rather than to make the effort to produce it on one rod. My mode of cultivation is very simple. It is not expensive. I have estimated very carefully, and I can raise corn for twenty-six or twenty-eight cents a bushel.

Mr. HERSEY (of Hingham). I have listened to the lecturer with a great deal of pleasure. I think he has told us many things which are of practical importance; and, as they come from one who has given the subject a good deal of attention, it seems to me that it is important to all those who are present, and, in fact, to the whole State. The corn-crop is one of the most important crops which we grow, and therefore any thing practical in relation to its growth is of importance.

There was one thing to which he did not allude, which I rose to speak of. I presume he would agree with me; but he could not, of course, cover every thing. It is, I think, a well-known fact, that, in this New-England climate, the weather during the months of May and June is rather too cold and wet for the growth of corn; and therefore whatever we do in the way of cultivation should be done in a direction which will have a tendency to make the ground drier and warmer. I think we should look to that fact, and that we should endeavor to so stir the ground, that it will bring about

that result. I will give you my idea; and it is a practical one, and one which has been tested during the last thirty years with hardly a failure, I may say without any failure, to secure a good crop of corn. When the corn is up so that it can be seen in rows (and the corn is planted three feet and a half apart, so that there will be rows both ways), a common horse-plough is run through the corn, and the earth is turned from the corn on each side, thus making a back furrow through two rows of corn. The first time of ploughing, the plough should be run across the field: if it is sward-land, it will always plough better. The corn is not touched at all with a hoe; but it is allowed to remain for a week or ten days, depending somewhat upon the weather. Then the plough is run through lengthwise of the field in the same way, thus making a back furrow that way; and, as you will readily see, it leaves the corn on a little square, flat hill, and this gives the corn a chance to feel more readily the warm suns of May and June. It will grow much better in consequence of this than it will if you turn the earth the other way, and cover the roots deeper. If you do that, the sun does not get at the roots of the corn so readily as it would if you turned it the other way, and left it on a little square hill. It has been our practice not to touch it at all with the hoe, but to allow it to remain in this way until it is found that the roots have approached about to the edge of the hill, and that will be generally about the first of July. After the manure is harrowed in, you see you have a compost heap really: you have scraped up all the manure in the winter, and there it lies fermenting. About the first week in July a common cultivator is run through, and, if you do not want to do any hand-work, run it through both ways, and thus level the ground off, and fill up those furrows. Your land at that time, if you have put on a fair amount of manure, will be in a very excellent condition for the growth of the roots of the corn, and it will also be in a better condition to resist the dry weather which is to follow.

Now, if there are any weeds in the centre of the hill, of course they must be taken out: and it has been our practice to go over it with a common hoe, and it can be done very rapidly, and without very much expense. Very nearly all of the work can be done by horse-power; and in this way I

am satisfied that a man can raise corn here in Massachusetts which will compete with the West, provided he makes proper use of the fodder. There is where the whole point, it seems to me, lies, — whether we can use the fodder to advantage. I am not willing to say that I think I can raise it so cheaply as the doctor has spoken of; but I do think that I can raise it cheaper than I can buy it. I believe that nearly every Massachusetts farmer who has warm land can do the same thing.

Dr. Wakefield. I have raised the Wauregan corn, and the doctor has given a description of that corn, and how he cultivates it. I wanted to know if I could get any other corn that would be more profitable than that. I saw the specimens in this room to which the committee have given the premiums; but I could not find out how that corn was cultivated. There was, however, one kind of corn that struck me very favorably, and I found out these facts in regard to it: it is the Milliken corn. I have no interest in that corn, only, if it is better than the corn I have been cultivating, I want to know it. It appears that the boys in Maine, stimulated by the premium that was offered by Mr. Allen, raised a hundred and sixty-two bushels of that Milliken corn to the acre. That is certainly a good, fair yield. A gentleman here says that he planted some of this Milliken corn, in a town in this State, on the twenty-seventh day of May of this year, and gathered it the last of August; and he says it was ripe two weeks before he gathered it. Now, that grew in about eighty days. That, in an ordinary corn year, is a safe crop. If you can get it in eighty days, you are pretty sure of a crop; and, if you can get a hundred and sixty-two bushels to the acre, you are pretty sure of a good crop. There are two good qualities. He told me how he raised that corn, how he cultivated it, how he manured it, and what he got to the acre this year. He cultivated half an acre. I don't remember the exact amount that he got; but I made up my mind that that was the best corn for me. With the facts that I had before me, I made up my mind that that was a better corn than the Wauregan. Now, if the gentlemen here will come forward and tell us how these other specimens of corn were cultivated, how long it took them to grow, what kind of seed it was, and can

state that they got more than a hundred and sixty-two bushels to the acre, got it with less manure, and got it in less than eighty days, then they will gain an advantage over that corn. That is what I want to know; that is what we all want to know. I came here to learn, and, if there is any thing better than that, I want to know it. I have made up my mind that that is preferable to the Wauregan corn; and, if there are any other varieties here that are preferable to that (and there ought to be, if they are entitled to that premium), then let the parties interested state the facts here. If they can show that any variety possesses advantages over the variety I have mentioned, we all want that corn. The doctor said that he had been trying to raise two hundred bushels to the acre. We would all rather have seed that will raise two hundred bushels than seed that will raise a hundred and fifty bushels: so we want to hear the facts. I asked a while ago if those gentlemen who have taken the prizes would come forward and give us that information. I understand that there are some of them here in the room. I don't know that the gentleman who took the first premium is in the room; but if there is any gentleman here who took a premium (I don't care whether it was the first, the second, or the last), if he can tell us the facts in regard to the cultivation of his corn, we would like to hear them. I have stated the facts in regard to this Milliken corn, because I was able to get them here; and, if there are any other varieties about which I can get the same information, I want to have it.

Mr. CHEEVER. I would like to inquire of the members of the Farmers' Club of Southborough, whether, in offering these prizes, any conditions accompanied the offer. I would like to ask whether persons who brought strings of corn here for premiums were required to state that it was grown on their own land, whether it was one particular variety of corn, or whether they had the privilege of picking it up here and there all over the Commonwealth, getting the largest ears they could from various bins. It seems to me these are important facts for us to know. If it is brought here as a mere matter of fancy, that is one thing; if brought for study, that is another. If there have been mistakes made this year, let us not make the same mistakes another year.

Mr. McMasters (of Southborough). No statement was required. The proposition was merely that they should bring in their corn in strings. We offered premiums on strings, and also on collections of varieties. There was no statement called for.

Mr. Thompson. I see the discussion is turning on the best kind of corn to raise. I find that some are very much in favor of Dr. Sturtevant's corn; and perhaps, in justice to him, it would be proper for me to state my experience with that corn. I purchased some of him last spring, and planted about an acre and a half rather late in the season; but it came up rapidly, and grew so that I had a very large quantity of stover on the field, and a very large quantity of ears. Although my friend Hapgood thinks that twin-ears are not good for any thing, I believe it is Dr. Sturtevant's habit to plant twin-ears, and I think that my corn, take the field right through, would average two ears and a half to the stalk; and, for a field planted as thickly as mine was, I think the yield was very good indeed. I think it speaks well for the manner in which that corn has been bred.

Another thing I will say in regard to that corn. I have never had a field of corn that has ripened up so uniformly, the ears so uniform in size, and filled out so well, as this field of which I speak. My experience is, that, of all the corn that I have ever seen planted, I should prefer that to any of the others.

Reference has been made to a certain kind of corn that suckered very badly. I wish to give my experience in relation to that. I see there are several strings of white flint-corn here. I got some of that two or three years ago down in Natick; and I was induced to try it from the fact that I found on one single stalk, with the suckers, thirteen well-developed ears. That was grown on rather poor land, and I thought if I could bring that corn up and plant it on my soil, which is somewhat better, I should get very much larger crops; and judge of my surprise when I found that that corn grew so tall, that a ten-foot pole standing on the ground would not reach the top, and there was not a sucker that bore any thing in the shape of an ear of corn. But it has proved very good corn notwithstanding, but not so good as the Wauregan corn, with me. On many of the stalks I

counted five well-developed ears. I did not intend to have but three stalks in a hill; but, owing to the drive in business, I was not able to thin it out.

QUESTION. I would like to ask Mr. Bowditch this question: Do you feel fully convinced in your own mind that an acre that has produced a hundred bushels of shelled corn this year can next year be made to produce, by the application of thirty-three dollars' worth of Stockbridge fertilizer, another hundred bushels, under favorable circumstances, and so on through a series of years?

MR. BOWDITCH. I have no reason to suppose to the contrary. I have raised magnificent crops of Stockbridge fertilizer, generally with great success. This year has been a very uncommon corn year. We may not see one again for a good many years; we have not before for a good while. But it has been my custom, after taking my corn-crop off, to raise a crop of wheat or barley stover, or something of that sort, without any other manure, and I have always got a large crop. There I put my manure on, and seed down to grass. I shall do the same with this field, and I expect to get from a ton to two or three tons to the acre of dried fodder from it.

QUESTION. Will Mr. Bowditch state the condition of this land?

MR. BOWDITCH. The land was worn-out grass-land. It is nearly fifteen years since it had a cultivated crop on it. It has been turned over once, and slightly manured, but did not get a good stand of grass. It yielded only three-quarters of a ton to the acre, and that was the reason it was ploughed up. It is what would be called river-bottom, very light bottom-land; naturally very good soil.

Capt. MOORE. I have only a few words to say in regard to some of the propositions of Dr. Sturtevant. One is this: You know, Mr. President, and every one knows who knows me, that I believe in thorough cultivation. He says that he goes just as far in that direction as profit will carry him; that is, in keeping down weeds. Now, the fact is, that, in these crops of corn grown as he grows them, the weeds are standing in the rows more or less, — large weeds up nearly as high as your head occasionally in the row, — perhaps all clean between the rows, except in the hills. I should say those

weeds exhaust the nutriment. Where weeds stand, they prevent the development of the corn: there is no doubt about that. Now, how far is any one warranted in recommending a course of cultivation that is going to fill your land with weeds? That is the point I want to make. They ripen up their seed, and they fill the land with weed-seeds. I was at the doctor's farm with some gentlemen two or three years ago, and saw some weeds growing in the rows of corn; and I said to Dr. Sturtevant, "Why don't you dig up those weeds?" Said he, "I have gone just as far as profit will warrant me in going in raising that crop." Now, in my judgment (and I think I shall be indorsed by some gentlemen here before me), those weeds could have been pulled out of an acre, at the proper time, with one half-day's work; and in my judgment those weeds made a difference of five bushels in the crop. And what would have been the result afterwards? The result would have been, that the next year the labor of keeping down the weeds would not have been half as much.

I don't like to see any young man (old men have got their habits fixed, perhaps) encouraged to grow weeds. I have cultivated land for a long while, and I have cultivated just as good a crop of weeds as any man ever thought of growing, and it paid me the least of any crop I ever grew. You cannot afford to grow them; and the time to kill them is on their first appearance. But, in that crop of corn, I could see how easily the weeds could have been kept out.

Now, one word further. I believe that the corn-crop is a valuable crop to grow. If a man has light land, and has not good grass-land, it is very desirable for him to have corn-fodder. I believe, further than that, when you say you can raise corn for thirty, forty, or fifty cents a bushel, when it is worth sixty, you can undoubtedly grow it for less than you can buy it. But I do not believe that is the question you are to decide. I believe the question you are to decide is, whether you can raise on a given piece of ground more dollars' worth of corn than you can of something else. That is exactly the point you have got to decide. Now, Dr. Sturtevant's land is not good grass-land: it is what I call light soil. He wants fodder to feed to his cattle, and I think raising corn is perhaps one of the easiest modes of

getting it. My condition is different. I can raise as good a crop of corn on some land I have got as he; but I can do a good deal better than to raise corn. That is my condition. Of course my condition, being near a large market, is entirely different from that of gentlemen in the back part of the State; and I can see that they may be warranted in raising corn where I should not be. Mr. Slade, as I think he would tell you if you got him up, cannot afford to raise corn: I know I cannot.

I must not occupy any more time, because there are a good many gentlemen here who ought to speak. I want to hear from Gov. Boutwell.

Hon. GEORGE S. BOUTWELL (of Groton). Mr. President, I am quite incapable of adding any thing of importance to what has been said, and especially incapable of adding any thing to the most excellent lecture to which we have listened this afternoon, — a lecture, I think, of more practical value than any which has been given in the history of our agricultural literature in my time.

I might differ from Dr. Sturtevant on one or two points. I rather agree with Mr. Moore as to the inexpediency of either raising weeds in a cornfield, or in allowing them to grow. I have tried both plans; and the conclusion I have reached is, that it is better to keep the weeds out of the field. They not only interfere with the growing crop, but they distribute their seeds to bother every future generation that shall occupy the land. It is not only our duty to raise good crops, but also to transmit the lands to those who come after us in a reasonably good condition, because land is not for the benefit of those who occupy it solely, but is held in trust for all the coming generations of men.

I have been one of those, who, for twenty years, have believed in the expediency of raising corn in Massachusetts, subject, perhaps, to some conditions. If your stock is not of a character to consume the fodder, it may be doubtful whether it is expedient to raise corn. If you have heavy lands, that are expensive in cost, and productive in power, with reference to grass and fruit-trees, it is doubtful whether you can afford to raise corn; and, if the two conditions co-exist, — inability to use the fodder in the most profitable way, and heavy land the only land that you can employ, — I

doubt very much whether it is wise to undertake to raise a crop of corn.

Now, if I may state my own practice, it is this: I have a hundred acres about my barn which are suitable for grass. On that land I do not undertake to raise corn to any extent. Occasionally I raise two or three acres, on account of some peculiar circumstances. I have also intervale land on the river, pasture-land (distant from my barn a mile or so, which is a light loam), and easily cultivated upland, well drained by nature, and exposed to the sun, and not very expensive land. On this last kind of land I have raised a crop of corn on the same parcel of sixteen acres for three years. Dr. Sturtevant saw the first crop two years ago this summer. The crop of 1878, raised on the sward, was a very good crop. The crop of 1879 was a poor crop. The crop of 1880 has been, for the character of the land and the tillage, a very good crop. The failure in 1879 was due, in part, to the season, and in part to the circumstance, as I think, that we neglected, at the time of the first cultivating, to use the hand-hoe. We ran the cultivator through it, and the weeds were left in the hills, and they got the mastery of us to some extent; and although we went through the field later in the season, and pulled out by hand those that had grown large, the crop of corn was very much diminished by weeds; and this year, at the time of the first cultivation, we went through with the hand-hoe, and just moved the earth around the corn, so as to interrupt the growth of the weeds.

Now, taking the mode of culture this year, it was this: we ploughed in the spring (not very deep, of course; for it was old ground), then harrowed, then put on half a ton of the Bay-State phosphate to the acre, then harrowed again, then planted. We planted, not with the horse-planter, but with the hand-planter. Then we went through once with the cultivator, and used the hand-hoe, and then twice with the cultivator afterwards. Then, when the corn was just earing, we cut it up, stooked it, and, when both the fodder and the corn were seasoned thoroughly, we husked the corn in the field, took up the corn and the husks every night, both being well seasoned, and put them where they were to be stowed.

We did not weigh the whole of the corn-fodder; but we

weighed a number of stooks, supposing them to be about an average. From that weighing we averaged the quantity, and we got a ton and a half or a ton and three-quarters to the acre, which I estimated to be worth ten dollars a ton. I am not quite sure as to the quantity; but I think we had about twenty-four tons on the sixteen acres. The result was, assuming ten dollars a ton as the value of the fodder, that my corn cost me twenty-two cents and three-tenths a basket of ears. We did not get a hundred baskets to the acre on this land. It is not very rich land, but pasture-land that has never been well cultivated; but I am satisfied that the land is in much better condition to-day for future crops than it was three years ago. I have not seen much difference in the crop of corn whether I have used the Stockbridge fertilizer or the Bay-State phosphate. I charge against the corn the entire cost of the phosphate, without any allowance for the benefit that may come to the land.

In regard to the use of corn-fodder, with great diffidence, I am obliged to say that I do not agree with Dr. Sturtevant about that. I have been in the habit, for many years, of having my corn-fodder cut (it is harvested, of course, when it is in a good condition for fodder) in a power machine into pieces about an inch long. I have now forty-eight cattle of various sizes, — about thirty cows, some heifers two years old, and some one year old; being equal, perhaps, to about forty milch cows. We give them about a third of a ton of corn-fodder a day in two feeds, one at morning and one at night. The cut feed is put dry into a feed-box, water-tight and nearly air-tight, with a close-fitting cover. Upon that feed we put a hundred pounds of cob-meal corn. The whole is saturated with boiling water (not having steam), mixed thoroughly, and covered as tight as an ordinary cover will fit to the box. One feed is prepared in the morning, and another at night; and of course it stands, one feed from morning until night, and the other from night until morning. Now, I have this to say practically: I have no scientific knowledge as to the value of this food; but we use it until it is exhausted, which is generally somewhere from the 15th of March to the 1st of April; and when we put our cows upon good hay, giving them an equal number of pounds, they do not give any more milk, nor look any better,

nor appear any more contented, than they do when they are fed upon corn-fodder; and, with the exception of a very moderate foddering of dry hay at noon, that is all they will have during the three or four coming months. Although I put corn-fodder, in the estimate I make, at ten dollars a ton, I sell a ton of good hay for every ton of corn-fodder that my cattle eat; and the quantity of milk that will produce from the best cows is as much as I think a cow ought to give. My best cow last year gave ninety-six hundred pounds of milk. Five cows averaged seventy-eight hundred pounds apiece, including the one that gave ninety-six hundred pounds.

Mr. WILLIAMS. As I live in a different locality from Gov. Boutwell, I would like to ask him what hay is worth when he reckons corn-fodder at ten dollars per ton.

Gov. BOUTWELL. I am selling hay at the barn now at twenty dollars a ton. Last spring I did not get quite so much.

Mr. WILLIAMS. You estimate your corn-fodder at one-half the value of hay?

Gov. BOUTWELL. That is what I estimate it at; but, as a matter of fact, I shall sell this year a ton of good hay for every ton of corn-fodder that my cattle eat.

Dr. WAKEFIELD. I should like to ask what kind of corn Gov. Boutwell plants.

Gov. BOUTWELL. I am one of the favored few. Dr. Sturtevant gave me some of his corn three years ago, and I have been planting it since.

[Capt. MOORE in the chair.]

Mr. EMERY (of Lowell). When I was up before, speaking of smutty corn, I did not say all I wanted to. As to the matter of corn-fodder, Dr. Sturtevant has said that he considers that less than ten per cent is stalks. I cannot say but what he is right; but it does not look so to me. I have been for the past three years feeding my cows upon corn-fodder and rowen, nothing else. Three years ago I cut my corn-fodder up, put it in casks of sixty gallons, trod it down solid, and carried it a mile and a quarter, where it was steamed in the casks; and then I carried it back to my farm, and fed it. I found my cattle did not like it. They would not eat it readily; they would not eat it as well as if I cut it

up cold, and put cold water into it: and I abandoned the practice. I cannot give any reason, only this, that my cattle disliked it. All steam that is generated in a boiler has a sulphuric acid taste to it. For instance, if you throw steam into your boiling water to make tea, you cannot drink it: it will taste like sulphur. Whether that was the reason why my cattle did not like that steamed fodder, or not, I cannot say; but they did not like it. Then I cut up the fodder, and used cold water, mixing it with shorts and meal, and I have continued that ever since. The first year, my man did not feed to suit me: the last two years, I have put a man into my barn exclusively to take care of my cows; that is, he does no other work, unless he has an hour to spare. I have about thirty head, and I venture to say that I have carried those cows through twenty-five per cent cheaper than I could if I had fed the fodder whole, and a great deal better. The cows leave scarcely any of the pieces. I cut it from an inch to two inches long. I give my milking cows two quarts of meal and six quarts of shorts a day; and to those that are not in milk I only give the shorts. I don't think I find five per cent of the stalks left when they get through. I give them in the morning a large coal-shovel full, and the same at night: at noon they only get a small feed of rowen. They come out very well in the spring, and I think much better than if fed on English hay in the old-fashioned way. My man gives them two or three mouthfuls: they use that up, and then he dashes the rest up to them, so that they clean it all up. Not a spoonful is left of the rowen, and very little of the corn-fodder. I think it is a great mistake to feed fodder uncut. The doctor thinks it is no use to cut it. I am perfectly satisfied, and those who have been with me and those who have watched me are satisfied, that I carry my cows through twenty-five per cent cheaper than those who do not cut their fodder.

Dr. Sturtevant. Do you mix your meal and shorts with your corn-fodder?

Mr. Emery. Yes, sir: I think it is economy to feed no more than two quarts of meal and six quarts of shorts. I think you get more milk, and your cows come through better. Then another thing: my cows are kept warm. I don't allow them to go outside to get water: they take their

water down below. I do not allow a day to go over them without their being thoroughly carded. I think in that way I get a better and cheaper result than I should if I did not cut my feed. I do not think anybody can raise corn unless he has a stock of milch cows to feed it to.

This year I am trying an experiment with sweet corn. I planted seven acres the 25th of June. That corn ripened up well. I cut it up the day before frost came, and got it in. I do not know whether that will carry me through any better than the other, or not; but there is this about it, that, if you dry corn-fodder too much, I don't think cattle will eat it quite so well as they will if you don't get it too dry. I don't care whether my corn-fodder comes out a little colored or not. The corn-fodder I am feeding now I took in earlier than I wanted to, and put on salt. It is not black, but it is discolored and moist; but my cattle are eating it as well as I ever knew them to eat any fodder before. I think a little mould — not the white mould, but a little black mould — does not injure corn-fodder at all. Cattle eat it just as well.

There is another thing which the doctor says, which would lead people to think differently from what I think. He says he does not care how deep he ploughs for grass, after he has got his corn-crop, for which he ploughs shallow. Now, I do not think that grass-roots (with the exception of witch-grass) go any deeper than corn-roots. They run as near the top of the ground, and take their nourishment as near the top of the ground, as corn; and therefore I do not see the necessity for deep ploughing. Aside from this, with the exception of planting his corn so thick, I should agree with Dr. Sturtevant.

Question. How do you cut your corn-fodder?

Mr. Emery. I cut it by a hand-machine.

Mr. Cushing. I have been feeding from twenty-five to thirty tons of corn-fodder every winter for the past four or five years; and it has been a great question in my mind, whether I could afford to go into the experiment I hear recommended of cutting and steaming my corn-fodder. The gentleman last up is of opinion that he receives twenty-five per cent better results by cutting it fine than by feeding it whole. I have been feeding twenty-five head of cattle thus far this winter, — two feedings a day of corn-fodder, and

one of swale hay, — and I have instructed my men to clean out the stalls daily, and save what they find in the stalls to cover my strawberries. I have not yet accumulated enough to think it worth while to spend the time to load it. I will not attempt to tell you how many pounds I have collected; but it is a very small heap.

I make milk for the Boston market. I know about how much milk I get every day. I strain my milk into cans. I have experimented with feeding corn-fodder and English hay, feeding corn-fodder one week, and changing it to the very sweetest of English hay the next week, and I have been surprised to find that I could see scarcely any difference; and oftentimes, when I have made the change, there has been no difference in the quantity of milk that I have received from my cows. Now, I would like to know if any gentleman present has experimented in that way with milch cows, feeding dry fodder whole, and then changing those cows on to the same quantity of corn-fodder wet, and to the same quantity of corn-fodder that has been cut and steamed. If there is any gentleman present who can give me that information, and say that the advantage in favor of cutting and steaming has been so great, that I can afford to hire men, and pay them the wages that I have to pay, and buy the necessary cutting and steaming apparatus, I want to go in for it. But, sir, I never could satisfy myself, that by chopping up my corn-fodder myself, instead of letting my cattle do it, who have plenty of leisure and strength, I should get enough benefit to pay me. I may be mistaken. I came to this meeting to learn. Now, if there is any gentleman here who has ever tried the experiment of changing from whole corn-fodder to cut corn-fodder, as I have described my process of changing from corn-fodder to English hay, and has found results that will warrant the outlay, I would like to have him state his experience.

Mr. Hadwen (of Worcester). Perhaps it is unnecessary for me to say that I am in favor of raising corn, and raising corn in Massachusetts. I believe it is for the interest of farmers to raise corn largely; and I think corn can be grown at as good profit as any other crop that is consumed by the farmer, where the conditions are favorable. But, in order to grow corn at a low price, you must have high cultivation:

the higher the cultivation, the lower the price of the corn per bushel, as a rule. I know that corn can be grown for twenty cents a bushel under the most favorable conditions; but it cannot be grown for twenty cents a bushel in the way that farmers usually grow it.

I will not at this time attempt to go into the discussion of the general subject of growing corn, but merely wish to add my testimony to what has been said. I abhor raising weeds among corn or any other crop. I do not believe that corn will thrive with weeds as well as without; and, after a crop of corn has been well cultivated, the expense of pulling the few weeds that would otherwise go to seed is hardly worth taking into account.

I desire to add my testimony to the value of corn-fodder. I think where hay is worth fifteen dollars a ton, well-saved and well-cured corn-fodder is worth ten dollars. There is no question that as good milk can be made from well-cured corn-fodder as from good hay: consequently, I grow corn right in the city of Worcester, and on land that is within a radius of a mile and a half of the city-hall; and I grow it because I think I can grow it to better profit than any other crop, as far as I want to go in that direction. I believe that, for farmers who want to use corn on their farm, it is the most profitable hoed crop that they can grow. And there is one other point: if a farmer cannot grow all the corn he wants to use on his farm (and I notice one thing, Mr. Chairman, that farmers who buy corn somehow or other always have money to pay for it), it comes very convenient to bridge over a "corner" or a "boom" gotten up by the speculators. When corn is high, I am very sure to carry my own corn to mill; and, when corn is low, I keep it in store.

Mr. Sedgwick (of West Cornwall, Conn.). In 1869 and 1870 I was engaged in the production of milk for the New-York market, and raised a large quantity of corn-fodder to feed to my stock. In the winter of 1869 I put a steam-apparatus into my barn, and bought horse-power machinery to cut up my stalks, and fed my herd of thirty-five cows with corn-stalks cut up, and an average of two quarts of meal and four quarts of bran for each cow, mixed in with a bushel of the stalks, and steamed. I fed this for some time,

and my cows gave a good flow of milk. It occurred to me one day that I was doing this at a pretty large expense. It was a big job to cut up these stalks, a big job to get up steam every day (or every other day) to steam them, and I thought perhaps the extra milk which I was getting was due to the fact that the food I gave my cows was warm. So I proposed to myself a little experiment, which I carried out. Instead of cutting my stalks, I fed them whole and dry; but I warmed the water which I gave my cows to drink to a lukewarm temperature, and fed the meal and bran to them in the shape of warm slops; and I kept up the flow of milk just as largely as when I had steamed the food, and taken the labor of cutting up the stalks. That satisfied me that it did not pay to cut corn-stalks.

One thing more: I made up my mind then that I would find out if the value of steamed food did not come from the fact of the warmth of the food and the water; so, after feeding in the way I have described for some little time, one Monday morning I told my men to feed the food dry that week, and let the cows out to drink the aqueduct water in the yard. They did so for one week; and the result was, my herd of thirty-five cows shrunk one forty-quart can of milk within that time. When, the next week, I returned to the same system as before, they came back to the same yield of milk.

QUESTION. Did they have the same quantity of fodder in weight as when they drank warm water?

MR. SEDGWICK. I should say that they ate a great deal more. I became satisfied that it did not pay to cut up corn-stalks; and I have not cut up any since, although I have the machinery in good condition to do it.

MR. ——. I would like to say a few words in reference to cutting corn-fodder and cooking fodder. The gentleman who was just up has been through the same experiment that I have, and with about the same result. He has stated one point about which I was in doubt; and that was, whether warm food produced an improvement in the flow of milk. I kept my herd of cows in an old mill, on account of the burning of my barn; and I found, when I commenced feeding them this warm food, that at the end of a week they had increased the quantity of milk from two to four quarts per

cow. The increase was so great, that I continued to feed in that way through the winter. I do not know, but I suspect that it was the warm food rather than cutting the stalks, which produced the result.

Mr. ——. Charles Lamb, in his "Popular Fallacies," says that one of the best things about a feast is, that there is usually something left for next day. One reason why I raise corn has not been stated here; and that is, for the preparation in which it leaves the ground for the next crop. I very much prefer to sow my grass-seed in my cornfield. I have been in the habit of raising small corn by level culture, and sowing grass-seed in the corn. I state that point because I do not want it passed over. I think there are other gentlemen here who have had like experience. By raising a corn-crop two years in succession, we prepare the ground for seeding back to grass, and accomplish just the thing we want to accomplish. I am glad to say, in his presence, that my attention was first called to this subject by our honored ex-governor, who, in an article in the public press some years ago, referred to this matter, saying that the two crops which we could raise in Massachusetts in our hill towns were corn and grass; and by this process we can raise them profitably and successfully, I think.

The CHAIRMAN. I will call upon Mr. ALEXANDER HYDE of Lee, who knows a great deal about corn.

Mr. HYDE. I do not know as much about corn as you may think I do. I know more about apples and potatoes than about corn. My farm is a grass-farm. I can raise grass more easily than I can corn, and my wife says I am all "gone to grass." I want to express my great gratification, however, at the essay to which we have listened this afternoon. It was very exhaustive indeed for so short an essay. But there was one little point I would like to have had him carry out more fully; and that is, the benefit of cultivating our land, from the aëration which it gives to it. He spoke of the great benefit of cultivating our corn-land, and did it exceedingly well. I agree with him entirely; but, when he came to speak of the special benefits, he mentioned the mulching which it gives to the surface: he mentioned not pruning, causing the plant to throw out more succulent roots from the main stalk, to produce more corn and less

stover. But there is one other advantage to which I would like to call your attention; and that is, that, by cultivating the land, we aërate it, and we draw from the air — that great reservoir of fertility — a very large amount, and the soil absorbs it. Old Jethro Tull used to say, that, if we would only cultivate our lands sufficiently, we could get along without any manure whatever. He carried his theory undoubtedly too far. But from my observation I am satisfied that we can get along with very much less manure, if we only cultivate our land thoroughly, and pulverize it so that the air will penetrate it. It will not only have more moisture, but it will have more air. There is more fertility in the air than we think for. Every time we burn any thing, all the organic part goes into the air. Every kind of vegetable that decays on the surface, every kind of leaf that decays on the surface of the soil, the organic part goes into the air, and from the air it must come back; and we want to keep our soil in such condition that it can absorb this fertility from the air.

If Dr. Sturtevant is in the house, I would like to have him give us his opinion upon this point, — the cultivation of our soil by making it an absorbent of atmospheric fertilizers.

Dr. Sturtevant. All the carbonic acid in a plant, the great bulk of the plant, — that which forms the woody fibre, the starch, the sugar, and enters into almost every part of the plant, — passes to the plant through the green coloring-matter of the leaf; and in our agricultural plants we can lay it down as a rule that no other substance is absorbed by the leaf except carbonic acid.

Mr. Hyde. I agree with you; but I think the soil will absorb a great amount more if we only have it porous, so that air can penetrate it. The nitrogen of the air comes down, the ammonia comes down, and is absorbed by the soil. Is not that so?

Dr. Sturtevant. The question of its absorption, I think, must be put under advisement. I know of no case where it has been really proved that the soil absorbs much fertilizing material from the air, or that the plant receives much fertilizing material directly from the atmosphere, with the exception which I just stated. But this whole question of the formation of nitrogen in the soil is a very obscure one. It

seems probable that the nitrogen of the soil, or "soil nitrogen" as it is called, becomes fit for plant-food, becomes soluble, and thus assumes a form in which it can be appropriated by the plant through the agency of a ferment in the soil. That seems very probable: many claim that it is proven. We know that some plants seem to acquire nitrogen from the atmosphere in some indirect way, perhaps directly. I refer to leguminous plants,—clover, beans, pease, and things of that sort. The cow-pea of the South very likely would be accepted as a type of this class. But the majority of our agricultural plants do not use this soil nitrogen directly: if they use it at all, it is only indirectly, and in such small quantities, that the finest experiments have not been able to determine it. But I should like to have Professor Goessmann speak of this, because he is a chemist, and understands more about it than I do.

Dr. Goessmann. The air contains at all times carbonic acid, and, in most instances, also nitric and nitrous acid and ammonia. The soil absorbs continually more or less of the former, and receives in particular the nitrogen compounds by means of rain and snow. Once absorbed by the soil, they find access to the plants by the roots as carbonates and nitrates, where they assist in the formation of the organic portion of the plant. Besides this direct support of plant-growth, they serve also the very important purpose of increasing the supply of inorganic plant-food; for they aid in the disintegration of the soil, rendering the insoluble mineral constituents of the latter more or less soluble, and thus accessible to the plants. Plants, as well as animals, need certain mineral constituents for their growth. The speedy and complete supply of these substances—as potash, lime, magnesia, phosphoric acid, etc.—is essential for a successful growth. To supply the entire amount of mineral constituents of plants required for the production of any crop by home-made manure, or by commercial fertilizers, is in most instances too expensive an operation to secure a satisfactory pecuniary result. We distinguish, for this reason, as far as the superior chemical composition and general physical condition of the soil is concerned, between various kinds of lands, as first, second, or third class. To devise economical and rational ways to render the latent plant resources of his soil

in the highest degree available, must be, for obvious reasons, one of the principal aims of a farmer. A thorough mechanical treatment of the soil is a most efficient means to promote that aim.

Mr. Bowditch. If you will allow me one moment, I think there is an impression among the people who grow corn that it is impossible to raise a crop free from weeds without using more or less hand-labor. I do not like weeds myself any better than my friend Capt. Moore does; and yet, for the last few years, I have made it a rule never to allow a hand-hoe to go into my cornfield. I should be perfectly willing any time during the season to have my field examined by Capt. Moore, or anybody else, in regard to cleanliness. I never had a cleaner cornfield than I had this last summer; and I doubt if there was a cleaner cornfield within ten miles from here, including even small patches weeded entirely by hand. I think I cultivate once or twice oftener than Dr. Sturtevant, and this year I got a new horse-hoe. It is made with three disks on each side, in the same style as a Randall harrow, with wheels on each side, so arranged that they can be set at any angle. You can accomplish with this hoe what Mr. Hersey says he likes to do. By reversing the wheels, you can throw the earth away to warm the roots, or you can ride over corn eighteen inches high. I think that helped me this year to raise the cleanest field I ever had. I was able to throw the earth over any young weed that came up between my plants. I plant in drills, the same way that Dr. Sturtevant does. It seems to me that that is one great point in regard to the question of our ability to raise corn profitably here in the East, to be able to say you can do it entirely by horse-power, and have the field as clean as it can be kept by hand-culture.

Question. Does the driver ride?

Mr. Bowditch. He does. He takes a pair of horses, and straddles the end of the pole; and in that way, by his own weight, makes the disks go down deeper or less deep.

Question. Do you plant your corn with a machine?

Mr. Bowditch. I plant it with a Western planter, called the "Climax Planter." This machine plants just an acre an hour. I planted this field which the doctor has mentioned in seventeen hours. It drops in two rows, three feet eight

inches apart; and the dropping is regulated by a boy who rides, and moves the handle. It dropped three kernels at a time, nineteen inches apart, instead of fourteen, as I intended. The wheels of the machine are made concave, so that they fill in the earth directly over where the corn is dropped, and press it down so hard in going over, that it is impossible for the crows to pull it up. I have used it for three years; and, since I began, I have seen twenty crows pulling away after the corn had got above ground, and I found that they had nipped the tops off; but it was utterly impossible for them to get a kernel up. I did not lose this year one solitary spear of corn, to my knowledge.

QUESTION. What is the expense of that machine?

Mr. BOWDITCH. Twenty-nine dollars. It paid for itself the first year I used it. I planted thirty acres. It has not cost me one cent since I bought it.

Mr. HILLMAN. What fertilizer did you use?

Mr. BOWDITCH. The Stockbridge fertilizer.

Mr. HILLMAN. That may account for your ability to keep your field free from weeds without carrying in any hoes. I had a field manured with stable manure pretty heavily. I cultivated the field six times each way, and left part of it without hoeing; and along about the first of July, as I went into that part, I found weeds as high as my hips in the hills: the rows were perfectly clean. I believe that that result must follow where you use stable manure. You may, if you plough thoroughly, and use the Stockbridge fertilizer, succeed in getting along without the hoe, and yet not be so ashamed that you won't let one of your neighbors look into your cornfield if you can help it; but I don't believe it can be done if you use stable manure.

Mr. BOWDITCH. I think it can.

Mr. HERSEY. On some of my ground I did not have any trouble with weeds at all. I did not put any thing in the hills. Of course, that was clean. In my method of cultivation, the ground is all ploughed up both ways, and there could be no weeds there; and, when the cultivator separates it, that finishes every thing that has come up after it was ploughed. My field was perfectly clear of weeds.

QUESTION. Was your land ploughed up where the corn was growing in the hills?

Mr. HERSEY. There was the trouble with me. I could keep the field perfectly clean everywhere except in the hills. There the weeds would grow just as well as the corn. I have made it a rule not to allow weeds to grow on my land. I think clean culture is one of the most important things to be considered. I will here say that I visited a farm once in New Hampshire, located on a high hill, where the farmer had occupied it fifty years. I looked that farm over, and I could not find a single weed among his cultivated crops. He had taken pains year after year to destroy all weed-seeds, and had thus cleared his land. I think that is an important thing for us to consider, that we must stick to clean culture.

QUESTION. Do I understand Mr. Bowditch to recommend planting corn in drills, three kernels in a hill, fourteen inches apart?

Mr. BOWDITCH. The heaviest crop I ever raised, I raised without a machine, by dropping a kernel every three inches. I harvested a hundred and five bushels of shelled corn to the acre.

Mr. WILLIAMS. Were there any stones in the land?

Mr. BOWDITCH. No: it was a clean field.

Mr. WILLIAMS. Could you use this horse-hoe and planter you speak of where there were a great many small stones?

Mr. BOWDITCH. Yes: small stones would not do any harm.

Col. GRINNELL. I would like to ask Gov. Boutwell whether he is perfectly satisfied that the better way is to cut corn up at the roots, rather than to top it. The practice has been changed two or three times in that regard, within the last fifty years, up in the valley; and perhaps it is pretty well settled now in favor of cutting up at the roots. But I would like to have the matter ventilated a little.

Gov. BOUTWELL. I can only answer for myself. I say that I would not have the tops of corn cut if it could be done for nothing. I prefer it cut up from the ground: it preserves the whole body of the fodder in as good condition as the tops can be preserved if you cut them and manage them in the best possible way, and you have left the remainder in the field for the frosts and rains of autumn to work upon, and it loses its value very rapidly.

Adjourned to evening.

Evening Session.

At the evening session Mr. Bowditch occupied the chair, and the following lecture was delivered by Mr. E. C. Gardner of Springfield: —

FARM ARCHITECTURE: HOUSES AND BARNS.

The subject assigned to me this evening — "Farm Architecture: Houses and Barns" — contains an implied architectural heresy.

It is as if one should say, "integrity suitable for farmers," "virtue adapted to farmers' wives," "modesty and good manners appropriate for farmers' children."

Farm architecture in its essentials is precisely identical with all other domestic architecture the world over, from London to Kamtschatka, from the Aleutian Islands to Patagonia.

It is building the shell that encloses and protects the family. It is a matter of common sense, of evolution if you please. Where gregariousness is the domestic habit, and protection from the elements the chief aim, a single cell covered by rocks, turf, logs, or reeds, suffices. Different conditions and tastes lead to different results; but, wherever a human habitation is built in the most simple and natural fashion to supply the real needs of the family, there is good domestic architecture, — an architecture that is safe, comfortable, useful, beautiful, and in thoroughly good style, which to many people is more than comfort or safety. And this is true, whether the architecture is for farmers, princes, or presidents, cattle or sheep. It is a question of common sense.

Horace Greeley remarked that people should not be asked to exercise their common sense who have none; and for a similar reason it is not always expedient to insist upon a declaration of first principles. It may be better, at times, to act blindly than not to act.

But when we find ourselves going astray like lost sheep, plunging one after another into sloughs of despond, or beating against the rugged barriers of hard times, hard work, and a weary lot in life; when we see thorny pastures where

once were cornfields and orchards, and houses that have been honored homes, now dishonored and deserted, — it is well to go to the root of the matter, uncover our mainsprings, find out the why and wherefore, make a new survey of the road we are travelling, and see whether our guide-posts are in truth lamps of wisdom kindled by experience, or will-o'-the-wisps of fashion and indolent conservatism.

To be logical and explicit, I assert that our farm-buildings are pitifully below their present possibilities.

How to give a fresh impulse, an upward and onward lift toward changing this, is the question.

Before setting out upon the hard, uninteresting turnpike of practical details, let me refer to a familiar and most significant fact.

We read of people who awake some fine morning and find themselves famous.

We Americans awoke a short time ago, and found ourselves artistic, or at least enthusiastically determined to become so. Cheap chromos led the procession, and now fill the air as the painted leaves fill the woods in October.

Dados and draperies demand our admiration. The stork is abroad in the land; Eastlake corners and angles assert their rectitude; white china is dismissed in disgrace, not because it shows dirt, but because it does not show peacocks' plumes, butterflies, and poppies.

House and sign painters are exhorted to compound impossible hues for the outside of our buildings. Freehand drawing has become a part of public instruction; and the boy, who, when we were young, would have been whipped for making pictures on his slate in school-time, and caricaturing the master on the fly-leaf of his "Webster's Speller," is the favorite pupil, specially detailed to embellish the blackboard for examination-day with his sketches.

What is more to the point, the "fine art" department in the country fairs no longer consists solely of monochromatic drawings in leather-work frames, but ranges from original landscapes in oil to antique vases modelled in native clay.

Some of us are sceptical of new things, remembering how the latest and best runs through the land like a breezy flame through a field of stubble, leaving a handful of useful ashes behind it, — blue glass, Colorado beetles, "Pinafore."

But doubtless the awakening of artistic tastes, especially the application of art to industry, is a fever that will change the current of our life-blood, making the generation that is advancing different in many respects from that which is passing away, affecting directly or indirectly all our activities and national interests.

The love of outward beauty and the desire to create and own it are positive elements in human nature, whose demands insist upon gratification.

I look upon this general awakening interest in art as one of the most important and permanent allies in promoting the welfare of agricultural communities.

At first glance the connection between art and agriculture — pictures and potatoes — may seem remote. It is, in fact, most intimate, most beneficent, and so natural, that we shall ultimately declare it to be just what might have been expected.

Art is a sort of universal social solvent and panacea. More than any thing else, except practical piety, it counteracts and compensates for what we call the drudgeries of daily labor, — the monotonous routine of toil which is not and can not be interesting or satisfying for its own sake.

It is precisely this compensation which those need above all others, whose life and labor are spent in comparative isolation, and with slight changes of outward surroundings. It is the material blossoming, the visible charm of every-day life.

Now, if farmers' homes and farming communities are to hold the enterprising, intelligent, cultivated people who alone make any community worth living among, these homes and communities must keep up with the rest of the world in making life as full, as earnest, as beautiful, without and within, for old and young, — especially for the young, — upon the farm as it is in town.

This is the service which art will render if rightly taught and applied.

Of course, if we cannot have but one, — bread and butter, or the beautiful house, — we must have the bread and butter; but "these ought ye to have done, and not to leave the other undone."

Without the visible beauty, life is but half full; and full living is better than half living.

It is amazing that so few people seem to understand how life in the country on a farm ought to be and may be ten times more interesting, satisfying, and beautiful than it can be where men are crowded closely together.

There is not a home convenience, comfort, or luxury attainable in any town or city, whose full equivalent may not be had in farmhouses of similar degree; and there are opportunities, benefits, unspeakable glories I call them, in the country, that towns only see in their dreams.

To demonstrate this point I should have to go back to the Pilgrims, drag in our forefathers, dig up Worcester County, bring down Lenox, Stockbridge, and Williamstown, exalt co-operation, denounce selfish, narrow-minded citizens, convict highway surveyors, condemn the selectmen and county commissioners, and hang the "practical" architects and builders.

This would be too much, — too much for one evening. Yet many things ought to be done simultaneously; for the threads that make up the fabric of human society are so intertwined, that drawing one of them before the others are drawn serves to make the whole rougher than before.

Still we must each work in our own harness: and, leaving this general discussion, we will take up certain definite lines, which, if rightly drawn, may help to bring about the good time whose coming we all wish to hasten.

Farmhouses and barns in their architectural study must be separated into two classes, — those already built, those which are to be built, — the old and the new; the former being, perhaps, the more important, certainly the more numerous.

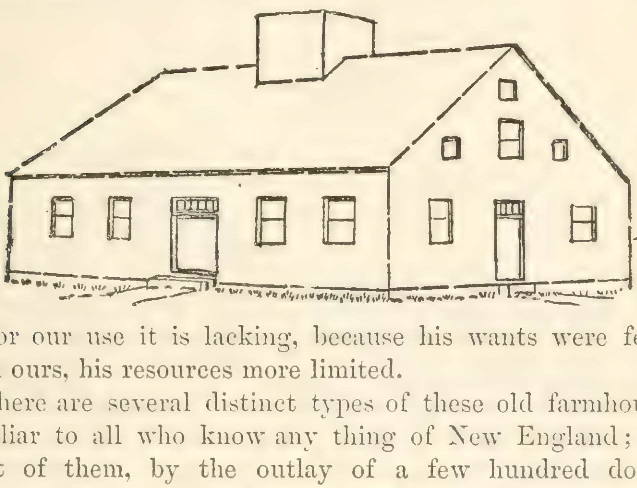
The average New-England farmer clings to the delusion that it is impossible to make two farms of one by short division. It does not occur to him, if, happily, he has two sons, that he may assign the old house to one of them, build a new one for the other, and when he dies divide his acres equally between the two.

He has found it hard to get a living from the whole farm: how, then, shall his sons support themselves and their extravagant, artistic wives from half of it? As a rule, the sons prefer to support themselves and their artistic wives in some other way, and will accept neither the old house nor the new.

Still, for the sake of the argument, we will suppose that the cards are out, the cake baked, and both the old house and the new in eager demand. With due respect to age, we will consider the old house first, beginning, where we usually begin in making acquaintance, with the outside.

On this point, the external appearance, there will be more to condemn concerning the new than the old; for the old farmhouse is commonly a picturesque object.

Architecturally viewed, its general form and composition are satisfactory, for the simple reason that the man who built it knew what he wanted, built what he wanted in the simplest fashion, and then stopped.



For our use it is lacking, because his wants were fewer than ours, his resources more limited.

There are several distinct types of these old farmhouses, familiar to all who know any thing of New England; and most of them, by the outlay of a few hundred dollars (perhaps less than a few, not so much as one), can be made not merely inoffensive in external appearance, but positively charming.

These sketches suggest roughly what may be done to the outside of the old house, without disturbing the interior, to bring it into more complete harmony with the artistic spirit of the age. By artistic spirit I mean that which prompts us to put whatever we have and use into the most agreeable shape, — that which will give us the most complete satisfaction, and to our possessions the most enduring value. This is not opposed to utility: it is the highest form of utility: it is enriching the labor of our hands with thought and feeling.

In-doors the problem is more difficult.

When there is any doubt whether it will pay to make over

an old house, there is no doubt: it will not. By making over, I mean making changes that involve moving partitions, enlarging rooms, tearing down chimneys, building new stairways, raising roofs, new plastering, and new interior woodwork.

An addition in the shape of a wing or an L, entirely new, a porch, or a bay-window, is a different matter.

Many old houses may be made young again, within as well as without, by simple additions that require no important tearing-away of the old.

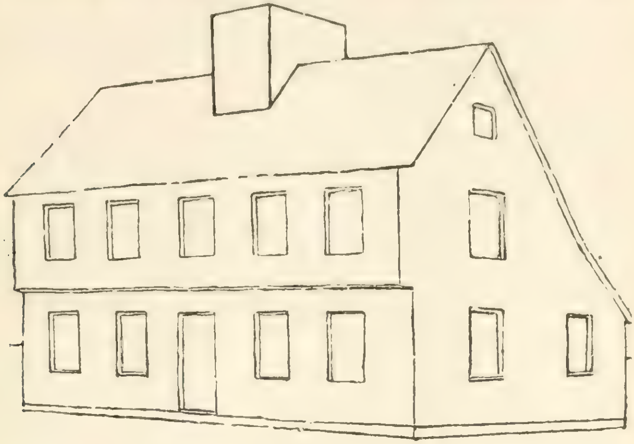
A few years ago it was the fashion to remove the old chimney, which filled so large a space in the middle of the house; and what a pandemonium its destruction made!

How the solid old monument of bricks and mortar and soot caused every body and every thing in the house to repent in dust and ashes the disturbance of its sacred hearths, the invasion of its mysterious flues!

In nearly all cases it is cheaper, to use no other argument, to build three times as much room as the chimney occupies, in some other shape entirely new, without offending the good spirit that presides over the old-time fireside. If this space is needed for an easier flight of stairs and a more liberal entrance-hall, one of the front-rooms may be used for these purposes, and additional room made somewhere else without regard to formal regularity.

The usual faults in the farmhouses of former years are the absence of porches (I wonder our grandmothers didn't catch their death-colds sitting on the stone doorsteps when

they came home from quilting and singing-school), the small windows and poor glass, the steep, narrow stairways, the low ceilings, and the dark cellars, not infrequently damp as



well as dark. The latter is the most serious defect, the most difficult to remedy.

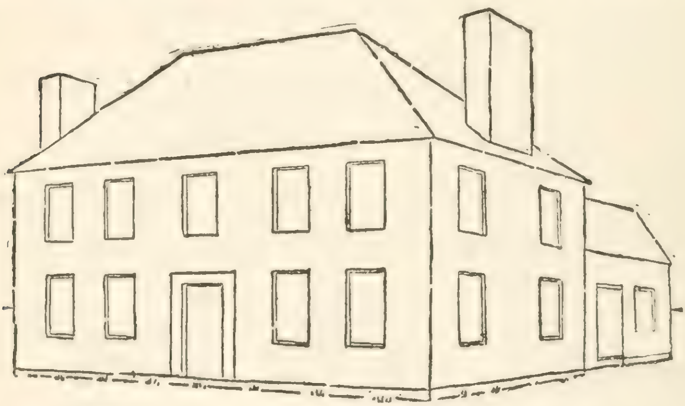
If a house-cellar is damp, persistently damp and mouldy, tear it down. Then build in a dry spot.

Yet something may be done for a wet cellar.

Dig a trench around outside nearly to the bottom of the wall, or at least until the stratum of earth is reached that

holds the water, and girdle the foundation with a drain of horseshoe-tiles, having one or more free outlets. Refill the trench with sand, gravel, or cinders, and cover the top with several inches in depth of clay and loam pitching sharply away from the house, and laying a shallow, open gutter of concrete or cobble-stones to catch the water from the roof, if there are no eave-spouts.

If the cellar is not deep enough for the modern furnace or steam-heater, and the walls do not extend below the cellar-bottom, build a new wall of bricks or stones two or three feet inside of the old, and below the cellar-bottom, leaving a sort of platform for bins, barrels, and boxes around the edges, and dig the rest two feet deeper. By this means the



old foundations are not disturbed, and the whole can be done in cold or wet weather.

When the old house rests so closely upon the earth that no sunlight enters the cellar through the narrow windows, and the cellar cannot be raised without great expense, nor the earth be removed around it, then build semicircular areas of bricks about the windows, and make the windows themselves large enough to admit plenty of fresh air and sunlight under the house. Darkness is the first station on the road that leads to dampness, decay, disease, and death. This is true of the new house as well as of the old.

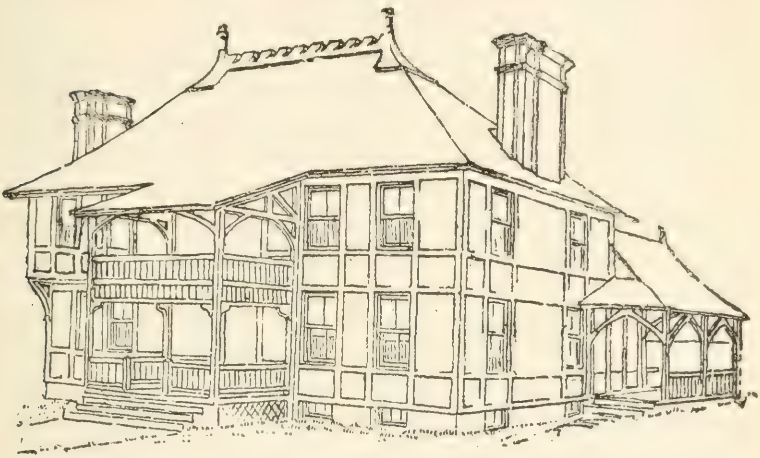
The absence of porches, and the ease with which they can be appended to the old house, has been suggested. But they need not be elaborate or fanciful: they should be generous in size.

I am sorry for a house that tries to look hospitable and inviting by holding out a stingy little balcony four or five feet wide. Eight, ten, or twelve feet are none too much.

But the wide piazza-roof must not be allowed to keep out the southern sun. Better omit the roof, if it stands on the south side, using a cloth awning for shade when needed.

The morning and evening rays are glad to enter aslant beneath an overhanging roof; and a wide north veranda is a capital place for the noonday rest.

To take out the small windows of poor glass, and substitute larger and better, is also a simple matter. The window



of a house is like the eye of the soul. If it is single and clear, the whole house will be full of light and cheerfulness.

The narrow stairs cannot often be improved, except by giving up a part or the whole of an entire room, as has been suggested; and the low ceilings need no improving, unless they are extremely low: indeed, just at present, low ceilings are the height of fashion.

In this, as in many other respects, accepting the situation, and making the best of it rather than the worst, will convert to a positive attraction what seemed a serious defect.

Old houses are sometimes subjected to another indignity, against which we cannot too strongly protest.

The old finish is torn out and made into kindling-wood, and the queer old mouldings and flutings of the architraves,

the bases, the wainscots and panellings, the chair-rails, ceiling-beams, and corner-posts, ruthlessly demolished. It is vandalism to destroy these honest, homely features. By all means let them stand; cherish them, renovate them, paint them with the choicest colors, decorate them, carve them, drape them, build shelves about them, ingeniously contrive to make them so quaintly interesting, and characteristic of your own particular home, that the village neighbors who live in stylish, stuck-up houses, shall grow green with envy when they behold them.

Above all things, don't commit the unspeakable folly of filling up, burying alive, the old fireplace. If it is too large for the modern wood-pile, line it with fresh bricks (moulded patterns cost but little more); and never make an apology for the high, stiff, old wooden mantel. Rather let us weep for our own stupidity if we cannot see and bring out the beauty it contains. The frequent superiority of these old members arises from the fact that they are the product of more thought and less machinery. The thought was not spread so thin. Hand and brain worked together then more than now.

It would be pleasant to linger in these old houses. There is a wonderful charm about them: they seem almost human, — almost alive. We feel something the same satisfaction in renewing their beauty and excellence that is found in giving health, strength, and good fortune to one who is staggering beneath a burden of sickness, poverty, and toil.

But there is a point for men beyond which restoration to health and usefulness is impossible; and there are plenty of old, dilapidated houses that only cumber the ground. Better the shallow basin by the roadside, with crumbling walls overgrown with faithful lilacs, cinnamon-roses, catnip, and tansy.

New houses, the second branch of our subject, must be considered as to their external appearance, their internal arrangement, and likewise their actual construction, taking the last first.

(Perhaps I should say that the term "architecture" is used in its broad sense, including much that should be called engineering, carpentry, and building.)

The site of the new house should be on dry land.

By careful draining it is possible to make a soil naturally wet fit to live upon.

Where any doubt exists, the entire site should be thoroughly underdrained. The foundation-walls should be solid; that is, laid in cement and mortar.

An enterprising rat with a large family on his hands will destroy more in a single winter than the whole extra cost of the mortar.

"Pointing" the face will not answer: it will stop "nearly all" the holes, but add whatever nothing to the strength of the masonry.

There are several good reasons why the first or principal floor of a house should not be too high up in the world. From the picturesque stand-point the lowly estate is decidedly preferable, especially as the underpinning is usually treated. But other reasons for keeping the living-rooms well above the surface of the ground are too important to be disregarded.

A free circulation of air and plenty of light underneath the first floor are indispensable to the best sanitary condition. These can be most easily secured when at least half the cellar or basement story is above the ground.

The porch and the main entrance-hall may perhaps be upon a lower level.

For warmth and dryness the cellar-wall above the ground, commonly called the underpinning, should be hollow, — two thin walls of stones, of bricks, or one of each; which introduces the subject of materials.

A bird's-eye view of some parts of New England gives the impression that the country must have been a "paved district" in some remote period, and that the paving-stones were laboriously raked up into stone haycocks and windrows. Where this raw material exists in such abundance that any hollow by the roadside, ravine, washout, or old well, is a genuine blessing as a burial-place for a few loads, it would surely be inconsistent to burn clay to make bricks for cellar-walls.

In fact, it is an incomprehensible mystery why the stones that have lain in plain sight year after year, patiently waiting till they have grown gray with the moss they have gathered, were not at once and exclusively employed by our

ancestors to build not only the cellar, but the entire walls, of their modest houses. Probably because it was a great deal harder work to chop and hew white-oak logs, and saw rock-maple boards by hand in a saw-pit, than it was to pick up flat stones, and pile them one upon another. And, having set out to be heroes and martyrs, they preferred to do things in the hardest way.

Where stones do not abound, the foundations from the very bottom may well be of hard bricks. Such a wall is smooth, clean, and dry. Rats and mice will gnash their teeth and squeal behind it; and it will endure till the crack of doom.

My thread divides again.

If the superstructure is of wood, a little commonplace technical description of its construction should be given, in order to bring out a certain point which ought to be made plain.

As every one knows who cares to, a wooden house, like a velvet bonnet, must have a "frame." This, in the case of the house, consists of the "sills," which are large beams lying horizontally on the brick or stone wall. Upon these stand vertically — most of them thin, flat, and set edgewise — smaller pieces of timber called "studs" and "posts," around the top of which is another row of timbers lying horizontally, called the "plates," and over these the rafters, variously inclined towards the zenith.

Between the sills, and level with them, are other horizontal beams, — the joists of the first floor. Eight, ten, or twelve feet above these are the joists of the second floor, if there is one; and still higher, perhaps, — for house-builders are an aspiring race, — the floors of the upper stories; the joists being usually thin, flat, and set edgewise.

The outside of the studs and posts is covered with boards in some shape, to keep out the weather; the inside, with wooden lath and a coat of mortar. On the top of the joists, boards are laid to walk upon; and underneath they, too, are covered by lath and plaster.

Between the different rooms, partitions are made of small, upright pieces of timber standing one or two feet apart, likewise covered on both sides with the same lath and plaster.

As bees build hexagonal cells of wax, so it seems to be

the instinct of the human animal of the nineteenth century in America to shut himself up in a rectangular cell with smooth, straight walls, and white, square, flat ceilings.

This is the genuine orthodox, conventional, modern mode of building a wooden house. It is evidently an aggregation of small wooden flues, which open into each other like the cells of the catacombs.

It is further evident, that if, between any two joists, an onion be fried or a cabbage boiled, the appetizing odors thence arising will fly through the house as a new scandal flies through a country village.

If an innocent mouse should chance to carry a card of matches to her home between the studs, mistake it for a piece of cheese, and, lighting it with her teeth, kindle a fire without calling the fire-engines, who could tell from the smell of fire, and the wreaths of smoke creeping from every crack and crevice all over the house, where the fire began, or where to throw the first pail of water? Of course every pair of studs and rafters is a flue that will draw like a steam-chimney, adding its own substance to the fury of the flames, till the house collapses like a punctured balloon.

What wonder that the voice of the crying baby, the crash of a falling pitcher, the wrathful voice of the master, and the shrill admonition of the mistress resound from the library, the nursery, or the kitchen in the north-west corner, first floor, to the south-east corner above, and back again?

The house is actually composed of inflammable wooden chimneys, partly horizontal, partly vertical; of streets, avenues, and alleys for rats, mice, flying squirrels, and cockroaches; of speaking-tubes and ear-trumpets; of unregulated flues and passages for hot air and cold, fresh air and foul.

Referring to this frail construction, one of the truly wise men of Boston remarked in a recent address before the fire engineers, that, as far as he could judge, "all that the architects do is to put up the most perfect specimen of combustible architecture, in order that the engineers may have the satisfaction of putting out the fires that are sure to occur in them."

Mr. Atkinson's criticisms are none too severe; for it is indeed a serious question. Still it has two sides; and here is the other side:—

Security against fire is not the chief requisite in an ordinary dwelling. More suffering and loss are occasioned every year by imperfect warming and ventilation than by conflagration. And it happens that hollow wooden walls, papered and clapboarded without, lathed and plastered within, are the cheapest warm and dry walls that can be made with present facilities.

Neither is it wise to apply the motto "fewer and better" to cheap houses. Rather the reverse; for a man who owns a bit of land and a house standing upon it—cheap shanty though it be, liable to burn up in an hour, or blow away in a hurricane—is a better citizen, and his children will be better citizens, than if he lived in the most indestructible hired tenement ever built.

Moreover, every architect with a modicum of common sense knows that these open flues in the floors, walls, and ceilings, should be completely cut off with bricks and mortar as often at least as at each floor and under every partition. The expense of this is too trifling to be considered. A man could easily do it all with his own hands in two days. Then, although a fire might possibly be kindled within the wall, out of sight, there would be no continuous draughts to fan the flame, and convey it through the building.

I say, "fewer and better" should not be the motto; for I would have no man feel too poor to build himself a house, and pay for it. But, by all means, let us have every attainable excellence, all possible thoroughness, durability, and beauty.

Especially should the farmhouse, which represents all that is dignified, noble, and enduring in domestic life, be made to resist fire, flood, and the ravages of time.

Business centres change; manufactures vary; mechanics must go where the forge, the lathe, and the engine call them. Commerce and trade have no respect for boundary lines. But the morning mists and the evening shades that climb the everlasting hills are the same from generation to generation. The rolling meadows and the murmuring streams will never catch the fever of emigration; and the brave old oak that scatters acorns down the hillside has no wish to change the fashion of its garments.

A farmhouse should be the very type of stability, repose,

completeness, and perfect adaptation to its condition and surroundings. For these reasons, I should say that a cheap wooden frame is not the best kind of farmhouse to build. A well-constructed wooden house is good; a well-built house of stones or bricks is better, and costs but little more.

To build the cellar-walls of rough stones, the underpinning of weather-worn, moss-covered cobbles, or small bowlders, giving architectual importance to the base of the building, — a most essential point, if the first floor is high above ground, — and the walls above of bricks, is, in stony regions where bricks are also to be found within reasonable distance, a wise use of material.

Small stones in their natural shape and color, for the main walls, are often recommended; but the arguments for their use are supposed to be rather æsthetic and picturesque than practical.

That is a mistake.

A wall of this kind, allowing nothing for the raw material, the cost of which will depend entirely on local circumstances, can be laid for from a dollar and a half to two dollars per perch of sixteen feet, which is less than half the usual cost of bricks. Neither is the use of stones that have grown gray, and spotted with lichens, a joke, or a fanciful expedient. Such wall is truly wholesome, altogether lovely: in fact, it is beautiful.

And if it is not solid common sense to use the cheapest, the most enduring, and the most beautiful material at hand, I do not understand the ingredients of common sense.

I believe also in bricks, even that terror of many sensitive critics, — "a brick house in the country." Not necessarily a square house, built of square bricks with a square roof, square windows, square doors, square doorsteps, and a square-toed family to live in it; not a house of pale-red bricks laid in white mortar, with a white cornice, white window-frames, white window-sash, and faded blue-paper curtains. But modest, simple walls with crooks and corners, if the convenience of the interior and the command of desirable outlooks require crooks and corners; a roof that looks like what it is, — a secure covering; porches and bay-windows where they belong; well-chosen paint for the visible woodwork; and plenty of glass.

Here is another direction in which we follow a beaten path, not because it is a pleasant road, or leads where we wish to go, but because it is beaten.

When glass was first used for windows, it was an expensive luxury, and, as is quite right and proper for expensive luxuries, was heavily taxed. Then there was an excuse for small windows. Now it is relatively one of the cheapest building-materials we have; and the man who builds a new house without providing for great floods of sunlight is an ignorant old fogy, or else he prefers darkness to light for scriptural reasons.

Large windows are cold. There is no denying that; but it is easy to double them; and, without introducing the question of warming, it may be said that the best place for the steam-radiators is under or near the windows, perhaps in a recess contrived to receive them.

If the walls are thick, and the windows not too near the floor, there will be plenty of room, and fresh air can be brought to them directly from out of doors. The nearer we can get to direct radiation from live heat, the better.

Solid walls of stone or bricks will be damp; that is, the internal heat will be absorbed by them so rapidly as to condense the moisture of the inside air.

The ideal, incombustible, indestructible house will have detached linings of hollow tiles or bricks, and the partitions will be of the same material.

For economy's sake an inner lining of wood will answer; and, if the flues formed between this inner lining and the outer shell are cut off at every possible opportunity, the insurance companies will guarantee against fire for a very small premium, and still pay large salaries to their officers, and liberal dividends to their stockholders.

Concerning the internal arrangements of farmhouses, only general suggestions can be given, — situation, size, and desired cost. The taste, needs, and aims of its occupants are conditions that vary indefinitely, and should be met with absolute directness and honesty.

If the peculiarity of the situation requires the kitchen to be in the front corner of the house, that is the right place for it. If it makes the pantry next neighbor to the main stairway, that proximity should be accepted as best for both.

The room or rooms most constantly used by the most important members of the family should be those, which, all things considered, are most desirable for such occupation. But rank varies in different families. With some the highest consideration is given to the children, with others to parents, with others to visitors and rich relations. I should vote for the children.

I think most housekeepers who in common phrase "do their own work" would like a kitchen to be light, sunny, and cheerful, with windows looking out upon the garden, orchard, or fields of grass and grain, — not into the barnyard or sink-drain, — and a view of hills and woods beyond.

Even if the heavier housework is done by hired help, this room, which is the workshop, and in which the daughters of the house must serve their apprenticeship, if they would ever manage households of their own, should be as comfortable as possible, and not placed beyond easy access and oversight from the family sitting-room.

I wish farmers and their wives and families, and all men of good sense and moderate means, with their wives and families, could learn what a great saving of expense, and what a grand addition to the enjoyment of living, is secured by using the best room in the house every day; in brief, by discontinuing the parlor as a parlor.

I wish husbands and wives could realize the fact, and practically illustrate it, that to no one but each other do they owe the best they have to give.

I wish fathers and mothers would understand that their sons and daughters will never be gentlemen and gentlewomen unless they learn to respect what is good and clean and beautiful by daily familiarity with whatever good things the house contains.

If parlor furniture, parlor ornaments, and parlor treasures have any higher mission than to civilize and elevate those who own them, I should like to know what it is.

We hear about the destructiveness of children; we hear of it, and we see it. It grows by indulgence. We can tell in five minutes whether a child has been bred in daily familiarity with the best things in the house. Sometimes he betrays his mother's early education. If he has, he knows instinctively what things are to be seen and heard, but not

handled, and will no more wantonly injure what he admires than he would purposely upset his bowl of bread and milk when he is hungry. If he has not had the benefit of this early training, he can only be kept within the bounds of decency by the nurse, the older sister, the father, mother, and both grandmothers. But as the good old lady, protesting against the destruction of her favorite theological dogmas, declared she would never give up her "total depravity," so there are people who cling to their parlors as their sole title to respectability.

They must have a room fifteen feet square, with darkened windows, a Brussels carpet, half a dozen hair-cloth chairs, a marble-topped black-walnut centre-table with horribly deformed legs, a "spring-seat" sofa, a worsted rug with an abnormal dog on it, a "whatnot" in one corner, and a bunch of dried grasses in the other, or the young ladies, poor things, cannot entertain their friends in good style, and the consequences will be fearful.

Truly it is a serious question, one of the legitimate side-issues in a discussion of the planning of farmhouses; for our home-life does depend to a wonderful extent upon the character and plan of the house we live in.

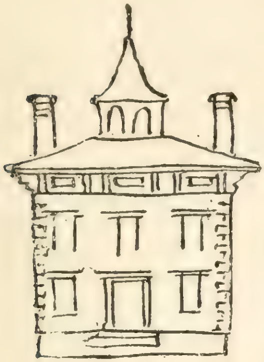
If, for instance, there is one large, cheerful sitting-room, which contains all we have for general use in the way of comfort, beauty, luxury, — a room in which the best thought and the best work of the household finds daily exercise and expression, — it will soon be found that another room for any sort of company is a sheer waste of resources.

On this great command hang all the law and the prophets of domestic architecture: our houses should be built to live in; not for show, not for company, not for fashion, but to furnish to the occupants the greatest amount of comfort and enjoyment all the time. Nothing should be so fine that it may not be seen and heard and enjoyed every day, nothing so poor and mean that we must hide it from our visitors.

And it will follow, as the day the night, that the home which is most freely and largely enjoyed by its inmates will be the most delightful in the hospitality it affords to kindred and friends.

Sydney Smith mentions a young lady who could fill a large book with the things she did not know. It would be pos-

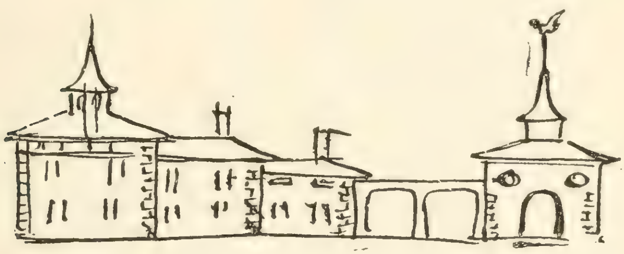
sible to make a great many very large books of designs of houses which ought not to be built: in fact, many such books have already been made, with truly pitiful results.



The public taste has been educated in the wrong way.

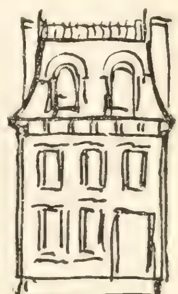
Many of these designs are accompanied by details of construction, and, in the hope of saving the expense of an architect's assistance, are frequently adopted, repentance following adoption sooner or later, according to the greater or less intelligence of the owner.

The second law of domestic architecture requires every house to be designed for and adapted to its own situation. Yet, to note the architectural products



of the last few years, one would say that the highest ambition of house-builders has been to imitate something else.

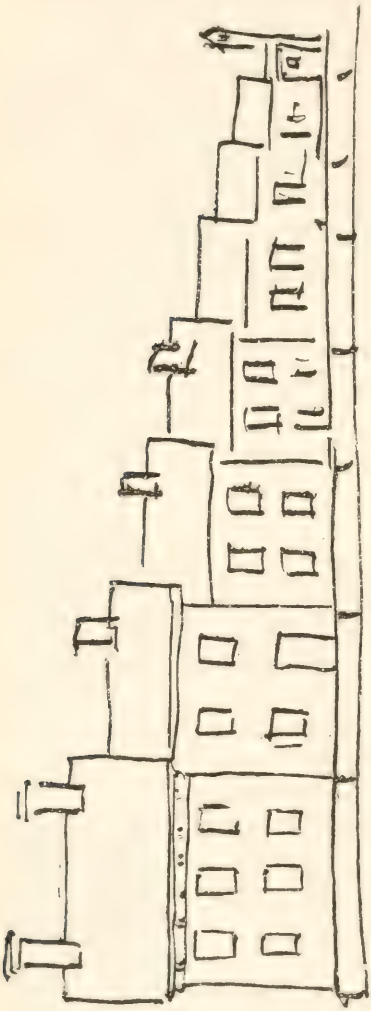
Some of these are utterly hopeless as to their exteriors. Nothing can be done for them unless we shove them together, — shut them up as we would a telescope, — which might not be altogether convenient or agreeable.



The modern French roof — a fashion, that, having nothing to recommend it, has already passed out of fashion — is interesting in comparison with its humble prototype the old gambrel roof. Even with its scroll-sawed brackets and cast-iron cemetery-fence on the roof, it is less attractive than the old house, and not half as suscepti-

ble to improvement. Here, as in so many other things, the new fashions are greatly inferior to the old.

Why not, then, imitate the old outright, it may be asked, if they are always better? They are not in all respects: and, moreover, in architecture, as in patent medicine, we should "beware of imitations."



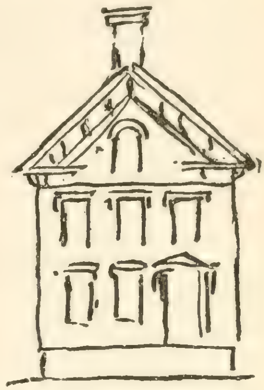
Yet a frank expression of the true purpose of house-building will doubtless bring us nearer to the old than to the new in outward form. It will give more breadth, and less height; more comfort, and less style; more strength, and less show; more that seems to belong naturally to the place where it stands, less of an imported, foreign look, — as if the house had strayed away from some town or village, and was vainly looking for a near neighbor to lean against.

As we go out to the barn, let us look back at the house a moment to see how it is painted.

We might profitably spend an entire evening in discussing color alone: we have only time for a hasty glance.

To step at once upon absolutely safe and solid ground, and broad ground too, we may say that Nature — who never utters discordant sounds, never makes a mistake in her colors, which are always elegant, always in the height of fashion — has an infinite variety, from the most brilliant hues that can be conceived to the rare,

pale tints that no man can name or classify; and she uses them lavishly on her own work. She manifests her gentle spirit, and at the same time her unerring sense of fitness, by painting the works of human hands a quiet, unobtrusive gray, treating them kindly, harmoniously as far as possible, but never allowing them to wear such garments of color as she bestows upon her own perfect creations. She paints every fence and wood-pile, every roof and artificial stone-heap, every bridge, barn, and house, the same quiet gray.



Still I do not think the good mother will resent our temerity if we sometimes humbly strive to imitate certain tints from her pallet; always keeping on the safe side, and not attempting to outshine our teacher.

She shows us many shades of gray, of brown, of olive, of maroons, and of umbers, as well as the warmer tints of drab and yellow. Even the good old Venetian red, with a broad frame, and background of green, is not to be despised. Above all things, we should study her combinations; for a discord in color is as gross a violation of natural law as is a discord in musical sounds.

One thing is past finding out, how it ever entered the heart of civilized man to paint the outside of his house the color of a piece of bleached cotton (that is, no color at all), a blank, dreary, staring, glaring, ghastly white, — the color of a ghost, of dry bones, of a dead snow-drift.

There is no excuse for it. It is an impertinent intrusion upon the landscape. It is a bit of white paper stuck upon an oil painting. Green blinds will not save it, nor blue ones, nor a green front-door, nor a picket-fence. Nothing will save it but distance, time, or another coat of paint.

The barn, unpainted save by Nature's gray, or dingy with "mineral" paint, is a far more interesting object than the white house.

On our way thither we may be compelled to pass through that abomination of desolation about farm-buildings known as the back-yard, where the unburied bodies, the disjointed

members, of old carts, wagons, sleds, and hencoops, lie crumbling to decay; worn-out stoves, stove-pipes, and tin-ware; rotting gate-posts; and knotty "chunks" from the wood-pile that won't split; broken barrels, broken crockery, hoops and hoop-skirts, "leach-tubs," iron kettles, ash-heaps, bones, and old boots. When into the midst of these interesting relics the outlet of the sink-drain is turned, with occasional overflows from the barnyard, the pig-pen, and the hen-house, the homestead can boast a veritable Slough of Despond, unsightly, unsavory to the last degree, and an unfailing source of typhus-fever and diphtheria.

This, however, is not architecture.

A farm-barn has commonly a fourfold use, — the protection of the live-stock against inclement weather, the storage of food for the stock, the manufacture and preservation of fertilizing material, and the storage of machinery, which, as the school-books say, includes every thing from a shingle-nail to a steam-engine, — shovels, hoes, and harrows; saddles, bridles, and ox-yokes; wheelbarrows, mowing-machines, and the family chariot.

That part of the barn which shelters the stock should be built accordingly. It should not only keep out the rain and snow, it should keep out the wind and the cold as far as possible. It should be light, thoroughly ventilated, and always dry.

Whatever materials are fit to build a farmhouse are also fit for this part of the barn, and *vice versa.*

It is not necessary that hay and grain should be wrapped in blankets to keep them warm; nor will it hurt the farm implements to stand in a dark, cold room, provided they are kept dry.

Common sense would therefore suggest that a barn which is to shelter stock may be an entirely different structure from the mere storehouse; and the usual mode of combining the two in one involves either a needless expenditure for the storehouse, or incomplete protection for the stock.

The manufacture and preservation of fertilizing material I put in the barn, because they belong to that department rather than to the house: strictly they belong to neither.

The elementary principles of economy have scarcely been learned as yet in this matter. The old-fashioned farmers

certainly gave to the wind, the rain, and the melting snow much of the essential wealth of their farms.

The more modern barn-cellar is hardly an improvement, — a stagnant, effervescing pit, from which much that is valuable is constantly escaping, absorbed by the soil, or wasting through leaks or drains.

I omitted to speak of house-drainage, in order to bring the drains together, and will not now discuss the sanitary bearings of the subject, — although in this respect we are but half civilized: our friends and neighbors are dying by the hundred, of sewers, cesspools, sink-drains, and poisoned wells; and thousands more are half dead, — but, keeping on the simple ground of economy and thrift, I wish to remark that every sewer, cesspool, and waste-pipe, every barnyard, pig-pen, and cellar, in which water is not absorbed as soon as it appears, is an intolerable nuisance, and a wicked waste upon a farm. It is so everywhere, but less inexcusable in villages, because the dwellers in town do not depend directly upon saving these raw materials of agriculture for their incomes, and to save them is more difficult.

It is the special duty of farmers, of all men, to make two blades of grass grow where one grew before. To this end every particle and atom of these valuable volatile elements should be saved, — saved by absorption.

Water, in the shape of drains and ditches, to convey these waste, or rather wasted elements, to some remote outlet, stream, or even a covered pit, to be cleaned out once or twice a year, or not at all, is a highway robber.

If it can be compelled to distribute the sewage of the house precisely where it is needed, by sub-irrigation, that is a wise economy.

Some time we shall be able to reduce all substances that have a manurial value to their most compact form, by chemical or other means. I think that time is rapidly approaching. When it comes, the earth will begin to bud and blossom as the rose, and we shall look back with amazement at the wasteful ignorance of our forefathers.

There are, then, good reasons for making a large frame-barn consist virtually of several different buildings. It will be cheaper, more convenient; the danger from fire will be diminished; there will be greater warmth, better ventilation,

and less opportunity for those huge, ostentatious structures, that, whether they themselves are ever filled or not, fill the community with amazement, and usually have the title of somebody's "Folly" conferred upon them with great propriety.

For a small barn there is less occasion for making an actual division of the building.

It does not pay to make a mountain in order to have a "side-hill barn."

With buildings well arranged, it will be less trouble to bring in upon a light truck the food and bedding for the stock, even if it comes from a considerable distance horizontally, and to carry the manure to its dry shed in another direction, than it is to drive around to the north-west corner, up an inclined plane half a dozen rods long, swinging the hay up towards the heavens, with ropes enough to rig a ship, pitching it down from the "great beams" over the heads and into the eyes of the cattle, with no end of dust, shovelling the contents of the stalls into a steaming pit still lower down, the same to be hauled out, with a great stress of ox-flesh, on the down-hill side of the barn, and finally carted around to the main level where it belongs.

It is a mistake to suppose that houses or barns or mills are any better for being piled one story above another. Unless land is worth many thousand dollars an acre, it is cheaper and better to keep the whole establishment as nearly as possible on a common level.

The days when the farmer tied two pieces of wood together, and with that primitive implement pounded out a bushel of rye, put it in one end of a bag, with a stone in the other, to keep the balance true, laid it across his horse's back, mounted the whole, and rode off to mill, are among the days that were. Farmers and their boys do not spend their evenings making flails, nor need they build "barn-floors" to swing them on.

The farmhouse of the future will be built mainly of bricks and stones. It will be broad, and not high. The windows will be large. Shade-trees will stand at a respectful distance, allowing the sun to rest upon it in healthful benediction.

Each room will have an open fireplace, wisely contrived

to give the greatest amount of heat and ventilation with the least consumption of fuel. A steam-boiler, which is only a scientific tea-kettle, will hold a slice of the summer months beneath the double roof all winter long.

Sunshine and good cheer will prevail from cellar to attic, from outer court to innermost chamber.

The roof will not leak; the chimneys will not smoke. Rats and mice will not raise armies, and fight battles in its hidden cavities.

The kitchen will be a workshop fully equipped, a studio in which the fine art of cooking will be learned and practised.

There will be a private room for every adult, and every child old enough to take care of a room.

There will be a library full of books, and a sitting-room so cosey, so interesting, so homelike and charming, that the parlor, if there happens to be one, will be literally left out in the cold.

Co-operation, nineteenth-century inventions, railroads, telegraphs, and telephones are bringing us nearer and nearer together, are making us more and more dependent upon one another, upon mutual intelligence, and good behavior.

More and more it is the duty of every man and patriot to let the light of his life and of his home illumine the world, and leave it better than he found it.

THIRD DAY.

The meeting was called to order at ten o'clock, Mr. JAMES S. GRINNELL of Greenfield in the chair.

Mr. SLADE. With your permission, I would like to offer the following resolution: —

Resolved, That the thanks of the Board of Agriculture are hereby given to the Farmers' Club of Southborough, and to the citizens of the town generally, for their generous hospitality on this occasion.

I move, sir, its adoption.

The CHAIRMAN. Before putting the question, allow me to say, that I think we have great reason to congratulate ourselves and the community on this most successful meeting. We have had, also, the very unusual pleasure of the presence of the Governor of the Commonwealth, who, as I happen to know, at great personal inconvenience, made it a point to

come here to manifest his interest in this great cause, and also to give his countenance and sustentation to the Board of Agriculture.

Mr. Slade. I would say that the Board have always heretofore refused to hold their country meeting in a town where hotel accommodations could not be furnished. The Farmers' Club and the citizens of this town have done remarkably well in taking care of the members of the Board and those who have attended the meetings; and, for one, I feel very grateful for the hospitality that I have received.

The question was then put, and the resolution unanimously adopted.

The Chairman. The lecture this morning is to be delivered by one of the most accomplished chemists of the country, and one who has devoted himself to, and done more in his way for, the cause of agriculture, than almost any other man whom we have among us. I was most happy to see that some remarks he made yesterday afternoon were received by you with every manifestation of appreciation and interest. I have now the pleasure of introducing to you the professor of chemistry of the Amherst Agricultural College.

THE SYSTEM OF PRESERVING GREEN FOOD IN SILOS.

BY PROFESSOR CHARLES A. GOESSMANN.

Mr. Chairman, and Members of the State Board of Agriculture, — Complying with an invitation of the Committee for the Arrangements of this country meeting of the Board, I take the liberty of asking your kind attention and indulgence for the presentation of a few remarks on the system of preserving green food in silos for the support of farm live-stock. The uncommon interest so generally manifested, of late, in the discussion concerning the merits of the silo system for storing up green food, is but a deserved appreciation of the important agricultural problem which that mode of keeping fodder, in the opinion of some of its advocates, is destined to solve. As the question how to feed our farm live-stock in a rational and an economical manner can only be considered as second in importance, in a general farm management, to the question how to raise our farm-crops in the most economical way, it seems

but judicious to investigate carefully any system of operation, new to our farm practice, which proposes to improve our present chances of securing economically an increased supply of green food, and thereby enable us to support more live-stock. The reduced area of lands serving as natural pastures, their quite frequently exhausted condition, the large demands for fodder in the dairy business, the increasing prospects of remunerative production of meat for the general market, the gradual change of an extensive system of general farming to an intensive one, — each, in its own way, tends to direct our attention to the consideration of the fodder question. Increased production of the fodder-crops is the most characteristic feature in our modern intensive system of general farm management. In the prevailing intensive system of farming in the most successful districts of Europe, from one-third to one-half of the entire area of cultivated lands is devoted to the raising of fodder-crops. The statement that plenty of fodder produces plenty of manure, and that plenty of home-made manure produces a plenty of remunerative crops, is there quite generally accepted as a safe rule. As the more prominent discussion of the silo system in our agricultural periodicals is, comparatively speaking, of a quite recent date, and the actual tests in our farm practice are still of an exceptional occurrence, it is not strange that quite opposite views regarding its real merits in our situation find their advocates. This stage of opinion is apparently, in a large measure, due to two circumstances: first, to a frequent misapprehension regarding the composition and the feeding value of the silo product — the ensilage — as compared with the original green crop; and, second, to the adoption of a different basis for the estimation of economical points involved. Without intending to detract any thing from the well-deserved recognition of the merits of the valuable experiments of John M. Bailey, Esq., of Billerica, Mass., and others elsewhere within the country, or to anticipate the final results of their practical investigations, I propose to discuss in a few subsequent pages the silo system with reference to its history in Europe, and from the stand-point of a careful scientific inquiry.

The preservation of green food in silos is at present mainly recommended for juicy plants, or parts of plants,

and for certain vegetable-refuse matter from several branches of industry. Prominent among these various substances are the stalks and leaves of the Indian-corn in blossom, the leaves of the sugar-beet roots, and the stems and leaves of potatoes. Grass and clover in wet summer seasons, the refuse pulp of the beet-root from the beet-sugar manufacture, and the potato refuse from the starch manufacture, also diseased and frost-bitten potatoes, and roots of various descriptions, have been kept in silos, and thereby improved for feeding purposes; and, finally, coarse grass-like plants, as rushes (*Juncaceæ*) and carices, or sedges (*Cyperaceæ*), which in their green state are, as a rule, but little eaten by cattle, have been prepared, in some instances, in silos, into a quite palatable and digestible cattle-food. The treatment of these and similar articles for their conversion into ensilage, or sour fodder, is usually carried out in either dry ditches or cemented cisterns especially constructed for that purpose. The green food, or the factory-refuse mass, after being reduced to a proper size for advantageous close packing, is put in layers, in the space prepared for it, and thoroughly trampled down, so as to leave no air-spaces in the mass. Horses are frequently turned to account to secure the desired compactness. In piling the material into the pits prepared for it, pains are taken to raise it, in the centre, to a conical-shaped elevated top somewhat above the level of the surrounding ground, whilst on the sides it is kept somewhat lower. This course is pursued to prevent subsequent depression in the centre of the silo. As soon as the packing-down is accomplished, at least two feet in thickness of earth is filled upon the mass, usually without using any layer of straw or boards to keep the vegetable matter and the soil separated from each other. The success of the entire operation depends on the dryness of the pit, the careful packing-down of the mass in the silo, especially along its sides, and the keeping-out of the air, in particular during the earlier period of fermentation. The contents of a carefully prepared silo soon undergo a peculiar fermentation; in some instances, of an acid character; in some of an indifferent or slightly alkaline character, which continues from one to two weeks, when they are ready for use: they keep in that condition for from six to eight and more months.

The original green food loses, during the period of fermentation, more or less of its weight, amounting, in some instances, to from forty to fifty per cent. This loss consists of more or less organic matter, and largely of water of vegetation. Very juicy articles shrink, for this reason, most: they are also apt to lose soluble constituents by leakage, in case the silos are constructed in a loose sandy or gravelly soil, instead of a compact soil or in cemented masonry. Some of the starchy or saccharine constituents are invariably transformed into lactic acid, — the acid contained in sour milk, — and other products characteristic of a slimy fermentation under the exclusion of air: in some instances considerable quantities of alcoholic products and fatty acids are noticed. The nitrogen percentage of the ensilage is, for obvious reasons, usually higher than that of the green food which served for its production; although a small percentage of the nitrogenous constituents of the green crops is destroyed, and changed into compounds of ammonia or of volatile alkaline compounds of a similar character. The color and the odor of the silo product depends on the success of the treatment, and resembles more or less that of the material used: in case of green food it is usually either dark green or yellowish green. A failure of the silo process is readily noticed by a strong, unpleasant putrid odor, and the dark brown or black color of the vegetable matter, which is also covered by fungi growth.

As agriculturalists differ not only in the details of carrying on the silo system in case of different materials, but also with reference to the same kind, I propose to describe subsequently some of the experiments of competent parties, to give a more comprehensive idea concerning the silo system as carried out abroad. Having on a previous occasion (Report, 1879–80, On the Feeding Value of Corn) described the rules which guide us in our decision regarding the comparative feeding value of our various articles of fodder, I omit further details.

Clover Ensilage. — The ditches were three to four feet wide, and from four to five feet deep, with sides slanting slightly towards the centre. Sixteen cubic feet of space were counted for every ton of green red clover in blossom. The closely packed green clover filled two-thirds of the depth of

the ditch, lined with compact earth; the remaining space was filled with the earth obtained from its construction; subsequently the soil was raised to from six to eight inches above the level of the surrounding ground. The contents of the silo, after ten months' keeping, were found to be of a dark-green color, of a slightly acid re-action, and of an agreeable odor. They were eagerly eaten by cattle.

The composition of the clover (*Trifolium pratense*) before entering the silo, and after its removal, was as follows: —

	FRESH GREEN CLOVER. Per cent.	ENSILAGE. Per cent.
Water	77.30	79.14
Nitrogenous matter	4.55	4.62
Ether abstract (fat, etc.)	1.19	2.03
Non-nitrogenous extract matter	9.20	5.98
Crude fibre	5.83	5.80
Ash	1.93	2.43

A sample of both substances, calculated for a perfectly dry material, was found to consist as follows: —

	FRESH GREEN CLOVER. Per cent.	ENSILAGE. Per cent.
Water	–	–
Nitrogenous matter	20.04	22.14
Ether abstract (fat, etc.)	5.26	9.76
Non-nitrogenous extract matter	40.53	28.66
Crude fibre	25.68	27.82
Ash	8.49	11.63

An examination of these analytical results shows that the amount of nitrogenous matter and the fatty acids have increased somewhat in the ensilage, as compared with the green clover; whilst the digestible non-nitrogenous matter of the clover has been reduced to from six to eight per cent in quantity. The total amount of organic matter destroyed has not been stated: it is no doubt larger, and quite worthy of notice, judging from the results obtained in the succeeding experiment, with a plant of similar character, — esparsette (*Onobrychis sativa*), cultivated saintfoin, — by H. Weiske.

Esparsette Ensilage. — The material which served in the experiment was cut on the 16th of June. One portion of the green esparsette was carefully dried, and saved for an analysis; another portion was packed tightly into a box, and

buried in the contents of a silo of the previously described construction. The silo was opened about two months afterwards for feeding purposes. The box also was opened on that date, and its contents carefully dried and analyzed.

	DRIED ESPARSETTE.	DRIED ESPARSETTE ENSILAGE.
	Per cent.	Per cent.
Water	–	–
Nitrogenous matter . . .	18.56	20.44
Ether abstract (fat, etc.) . .	2.89	6.02
Non-nitrogenous extract matter,	38.60	30.88
Crude fibre	33.93	35.18
Ash	6.02	7.48

A careful weighing of the green food in the box, before and after the treatment in the silo, showed that twenty-four per cent of the organic dry matter of the fresh green plant had been destroyed by fermentation.

Grass, *green lucern*, and *green lupine* have been treated in silos with similar results. Quite interesting, in this connection, are the experiments with a mixture of green food and straw, to study the changes of the latter, as far as its subsequent feeding quality is concerned. Green rye and green vetch, with straw of wheat and of oats, were chosen for the investigation. As these two kinds of straw may be cut somewhat before the full ripening of the grains, without any injury to the latter, — a course which cannot be safely followed in the case of barley, etc., — they disintegrate, comparatively speaking, quite readily, and thus become in a higher degree digestible when treated in silos with green food. Rye and vetch were taken just before blooming. One part of either one of the two green plants, and twenty parts of wheat-straw, were cut in a suitable machine into pieces of about one to two inches in length: for every hundred pounds of straw there was added from a pound to a pound and a half of salt. The green food and the straw were placed in alternate layers in the silo, and, after being trampled down, were covered in the usual manner with several feet in thickness of earth. The silos, in this case, were filled in summer, and opened as late as October, and their contents fed during the winter. The somewhat extended period of keeping them fermenting before feeding insured a proper softening and disintegrating of the straw, and therefore a higher

degree of digestibility. The fodder produced in this way had an odor and a taste similar to hay. Professor Voelcker, who speaks favorably of this mode of operation, obtained the following analytical results from the wheat-straw before its treatment, and after its removal from the silo.

	RAW WHEAT-STRAW. Per cent.	FERMENTED WHEAT-STRAW. Per cent.
Water	13.33	7.76
Fat	1.74	1.60
Nitrogenous matter	2.93	4.19
Matter soluble in water	4.26	10.16
Matter soluble in diluted acid and alkalies	19.40	35.74
Raw fibre	54.13	34.54
Insoluble mineral matter	3.08	3.20
Soluble mineral matter	1.13	2.82

These results show a remarkable increase in the soluble and digestible matter of the straw, being raised from twenty-three to twenty-four per cent, to that of from forty-five to forty-six per cent, not speaking of other favorable alterations in the original composition of the straw.

Leaves and Tops of Beet-Roots and Sugar-Beet-Root Pulp Ensilage. — The preservation of these refuse materials becomes a very important question wherever the agricultural advantages arising from the introduction of the beet-sugar industry enter into consideration. They form the basis of an extensive system of stock-feeding for the meat-market and the dairy, which is invariably connected with the beet-sugar industry in Europe. Assuming for the refuse-beet mass — leaves, tops, and pulp — the same amount of moisture which is contained in the fresh beet-root (eighty-two to eighty-three per cent), its quantity amounts in weight to nearly one-third of the entire root-crop, or from five to six tons per acre (leaves, two tons; *pressed* pulp, three tons; and tops, one ton). As an illustration of the changes which the leaves and tops undergo in silos, the following carefully conducted experiments may serve: A ditch from seven to eight feet deep, five feet long, and five feet wide, was filled with alternate layers of leaves and tops from the same lot of roots, until the solid trampled mass reached the level of the surrounding grounds. A layer of leaves, and subsequently a mass of earth several feet in thickness, served as a final

cover. The silo was filled in October, and opened for use in the following March. To ascertain at the same time the exact loss in organic matter which the above-stated beet-root refuse would suffer in consequence of the fermentation in the silo, a definite quantity of the contents of the latter was cut out, and at once carefully packed tightly into a box, and buried in the centre of the silo. The latter was closed in October, and opened for use in March. Leaves and tops had changed but little in color. The ensilage in the silo had lost forty-nine per cent in weight, as compared with that of the fresh green material. The contents of the box had lost by slow fermentation nearly one-fifth (eighteen per cent) of the dry matter contained in the green food. The fresh material contained 10.54 per cent of dry matter, and the ensilage only 8.44 per cent, These results demonstrate that juicy plants in ordinary ditches may lose as high as fifty per cent of their soluble constituents, and that, even in exceptionally careful managed cases, a serious loss of their organic matter is unavoidable. The process, on the other hand, had increased the rate of the digestibility of the cellular matter, and rendered the beet-refuse more palatable to cattle. (O. Kellner.)

Analysis of Dry Matter, of Fresh Green Leaves, and of the Ensilage of Beet-Leaves.

	FRESH GREEN LEAVES.	ENSILAGE.
	Per cent.	Per cent.
Nitrogenous matter . . .	26.71	21.23
Fat (ether abstract) . . .	2.75	8.79
Crude fibre	14.99	18.56
Non-nitrogenous extract matter .	37.13	39.42
Ash	18.42	12.00

The pulp of beet-roots, obtained from beet-sugar factories, is treated in silos in a similar way. Frozen roots and potatoes are either crushed or sliced before they enter the silo, and frequently receive previously an addition of one per cent of salt.

A few analytical statements in this connection may not be without interest, as they convey at least some approximate idea concerning the alteration which the sugar-beet root usually suffers before its factory-refuse mass serves as cattle-food. (Ritthausen; Voelcker.)

	Water.	Nitrogenous Matter.	Fat (Ether Abstract.)	Non-nitrogenous Matter, including Sugar.	Raw Fibre.	Ash.
Sugar-beet root (fresh) .	81.77	0.85	15.07	–	1.36	0.944
Diffusion refuse beet-root (fresh)	93.50	0.51	0.035	3.66	1.33	0.962
Diffusion refuse beet-root (pressed)	88.54	0.86	0.11	7.37	1.91	1.23
Diffusion refuse beet-root (pressed, and changed into ensilage)	89.83	1.02	0.08	5.94	2.53	0.60

Corn Ensilage. — The treatment of corn-fodder in silos has of late acquired considerable prominence in Austria and France. Both countries contain quite large areas of land, well fitted by climatic conditions for an advantageous cultivation of corn. The successful and extensive application of the silo system in the sugar-beet industry of those countries has apparently greatly stimulated inquiries into its usefulness for general farm practice. In many instances in France, where the sugar-beet root is sold from a small farm to distant sugar-factories, and high freight rates prevent the return of the refuse beet-root pulp to the root-grower, corn ensilage is used to make up the deficiency in fodder, caused by the sale of the root-crop. Our late home experiments are apparently largely inspired by the teachings of distinguished French agriculturalists. As I have reason to suppose that interesting descriptions of our home experiments will be presented here to-day by gentlemen intimately acquainted with that subject, I shall confine myself to the description of an investigation carried on at the agricultural experiment station at Vienna, for the purpose of ascertaining the precise effect of the silo fermentation upon the composition of green-corn fodder, and the degree of loss which the organic dry matter suffers under that treatment.

The green-corn fodder was cut at an early stage of blooming, and, without any other preparation, carefully packed into silos of the usual size and form. Several feet in thickness of earth served as a cover. An analysis of the green corn before filling the silo, and after its opening from two experiments, gave the following results: —

	Water.	Nitrogenous Matter.	Fat (Ether Abstract).	Non-nitrogenous Matter.	Crude Fibre.	Ash.	Sand.	Dry Matter.
A.								
Fresh green-corn fodder,	79.35	0.90	0.76	10.82	6.67	0.63	0.87	19.72
Ensilage from 15 inches depth in the silo .	57.69	1.86	1.88	7.48	18.32	1.90	1.80	33.24
Ensilage from 30 inches depth in the silo .	77.84	1.06	1.08	7.48	10.38	1.01	1.21	22.22
B.								
Fresh green-corn fodder,	76.72	0.98	0.92	12.24	7.70	0.64	0.80	23.28
Ensilage from a depth of 37 inches . . .	80.63	0.80	1.11	6.78	8.40	0.82	1.46	19.37

The following calculation of these results, calculated for the dry matter, gives a better chance to notice the changes of the latter in the green crop, as compared with the silo product: —

The Loss of the Dry Matter of the Green Crop in the Silos, stated in Percentages.

	Nitrogenous Matter.	Fat (Ether Abstract.)	Crude Fibre.	Non-nitrogenous Extract Matter.	Ash.	Sand.
A.						
Ensilage from 15 inches depth in the silo	27.8	13.0	3.40	44.5	5.9	–
Ensilage from 30 inches depth in the silo	32.4	14.5	5.3	57.9	2.10	–
B.						
Ensilage from 37 inches depth in the silo	34.4	3.1	12.4	55.5	2.30	–

Both nitrogenous and non-nitrogenous extract substances suffered the largest loss. The slight alteration in ash constituents proves that but little, if any, organic matter was lost in any other way than by fermentation. The corn ensilage contained in both cases various alcoholic products, and considerable quantities of fatty volatile acids. A careful comparative examination (A) showed, that, at about

fifteen inches depth in the silo. 27.9 per cent of the organic matter of the green-corn fodder had been lost, and, at a depth of thirty inches, 34.70 per cent; whilst in a second trial (B), at from thirty-seven to thirty-eight inches in depth, 34.8 per cent were lost. These results, in connection with those noticed in the previously described experiments with beet-root refuse and esparsette, demonstrate plainly that the preservation of green fodder in silos causes a considerable loss of valuable organic constituents, even when managed in an exceptionally careful manner. Those who are somewhat familiar with the transformation of starchy and saccharine substances into alcoholic products, and subsequently into acids, know that in either case nearly one-half their weight passes off in a gaseous state, and are therefore expecting in the silo treatment the largest losses in those articles of green fodder which contain in considerable proportion one or the other, or both, of these widely diffused proximate organic constituents of plants.

The composition of ensilage varies in a not less degree, taking the entire contents of a silo into consideration, than that of the green crop which serves for its production. The same is true as far as the ensilage in different parts of the silo is concerned, as has been shown in the preceding pages.

Composition of Corn Ensilage from Different Silos.

	Moser.		v. Johren.	Goessmann.*
Water	80.63	77.84	83.827	80.70
Nitrogenous matter . . .	0.80	1.06	0.706	1.56
Fat (ether abstract) . . .	1.11	1.08	0.769	0.62
Non-nitrogenous extract matter .	6.78	7.18	9.176	8.92
Crude fibre	8.40	10.38	4.263	6.43
Ash	0.82	1.01	1.261	1.77 (crude)

Some Extremes of Variations in the Composition of Green-Corn Fodder.

	Per cent.	Per cent.
Water	76.8	85.7
Nitrogenous matter	0.9	2.0
Fat (ether abstract)	0.4	0.7
Non-nitrogenous extract matter	6.4	15.3
Crude fibre	3.0	5.9
Ash	1.0	1.2

* From the silo of John M. Bailey, Esq., of Billerica, Mass., December, 1879.

From the previous analytical demonstrations it will be quite obvious that the recommendation of the corn ensilage cannot well be based on its higher feeding value, pound for pound, as compared with green-corn fodder. The increased digestibility of the cellular matter in the corn ensilage, and the small, if any, increase of nitrogenous matter, is from a physiological as well as a commercial stand-point, to say the least, a doubtful compensation for the sugar and starch destroyed by the fermentation of the corn-fodder in the silo. An economical and rational feeding of the corn ensilage, as well as the green-corn fodder, requires as a rule, except when fed for a mere sustenance, an addition of a stronger article of food to meet the requirements of either growth, or work, or the production of milk and flesh. The silo system furnishes no exception to the rule that our practical modes of preserving fodder are accompanied with a loss in quantity and quality of valuable plant constituents, and that any attainable higher feeding value of our fodder-crops is almost invariably secured at the sacrifice of quantity. The question of waste is simply a matter of *degree*, when comparing existing modes of keeping fodder with that of the silo system. The correctness of the previous exposition once conceded, it remains for me to discuss briefly some of the circumstances which tend to make the introduction of the silo system a valuable addition to our modes of keeping fodder, and thus of increasing our resources for farm improvement.

The management of the silo system for preserving fodder is independent of the weather, — an advantage of particular importance in the case of juicy plants, so largely represented among our fodder-plants. The long period required for their change into dry fodder, or hay, endangers in a higher degree quantity, and in particular quality, than in the case of common grass. Exposure of green crops to rain, even for a short period, during the hay-making, alters the quality of the hay far more than usually suspected. A few analytical results may convey some more definite idea about the extent of the change.

(E. SCHULZE.)	Good Clover-Hay. (No rain.)	Clover-Hay exposed for two weeks to rains.
Water	14.11	14.76
Nitrogenous matter	11.22	8.15
Fat (ether abstract)	2.40	1.61
Non-nitrogenous extract matter	35.33	29.61
Crude fibre	33.68	43.02
Ash	4.26	2.86
Sum of nutritive matter	48.95	39 36 (—20)
Matter soluble in water	27.77	15.34 (—45)

(E. HEIDEN.)	Good Clover-Hay.	Clover-Hay exposed for two weeks of rainy days.
Water	14.51	14.51
Nitrogenous matter	17.05	14.02
Fat (ether abstract)	5.06	3.29
Non-nitrogenous extract matter	31.04	9.77
Crude fibre	25.72	52.69
Ash	6.62	5.72

Good lucern-hay lost, in consequence of an exposure to some rain-showers, within two days, 7.13 per cent of its dry matter (O. Kellner); in another case, where the lucern-hay had within six days repeatedly suffered from rains, a loss of 16.7 per cent of dry matter was noticed. The nitrogenous and non-nitrogenous soluble constituents of the plants are mainly affected by rain. The stage of growth, the more or less advanced state of dryness of hay, and the surrounding temperature, control here, to a large degree, the extent of the loss in soluble organic matter.

Fodder-plants like clover, with coarse juicy stems and tender leaves, usually suffer seriously in their feeding value, by frequent handling, from loss of leaves, which are the most nutritive parts of the plant. The loss due to this source shows itself everywhere in the inferior digestibility of a common clover-hay, used in actual trials, as compared with carefully prepared clover-hay, where a large proportion of its leaves had been saved. The differences in the rate of digestibility of the various constituents of green clover and clover-hay, obtained from the same crop, arising from the

loss of leaves in the case of the clover-hay, has been noticed to amount, even in a careful farm management of hay-making in fair weather, to from two to six per cent less of the several proximate constituents of the dry matter in the clover-hay. Observations on lucern confirm the previous statement. The following analytical results give some more definite idea regarding the amount less digested of each constituent in the case of clover-hay as compared with the green clover. Cattle served for the experiment. (Kühn.)

	EXTREMES. Per cent.	AVERAGE. Per cent.
Total dry matter of fodder . . .	1.3 to 5.6	3.7
Organic matter	3.7 " 6.0	5.1
Nitrogenous matter	1.4 " 4.1	3.0
Non-nitrogenous extract matter . .	3.9 " 6.1	4.9
Crude fibre	2.3 " 6.8	4.4

Careful investigation of a quite recent date (Kühn, Wolff, etc.) has proved that a mere drying of our common fodder-crops, as grass, clover, and other leguminous plants, does not affect their rate of digestibility. The green fodder, and the dry fodder or hay (entire plant) from the same plant, in the same stage of growth, have shown a corresponding rate of assimilation of their dry substance. Whenever, therefore, the production of dry fodder can be carried on in a short period of time and in a satisfactory manner, the largest amount of dry matter of the highest attainable feeding value may be secured from the plant in that way: no other current mode of preserving its feeding value can equal it in regard to the quantity of the result. As, however, the quality of a dry fodder, as hay, clover, stover, etc., depends on the influence of the weather, and the mode of handling and of keeping, — circumstances which are to a large extent, in ordinary farm practice, beyond personal control, — our various articles of dry fodder are frequently far from what they might be, or ought to be. The above few analytical statements regarding the loss, in case of the dry fodder, by waste, of the tender parts of the plant, as well as regarding the influence of rain on half-dried fodder, give us at least a chance to *approximate* the loss, in nutritive constituents, from these two sources, which are liable to acquire unusual importance in case of those plants for which the silo system

has been judiciously recommended. The ensilage contains, without any particular exertion, the entire fodder-crop, leaves and stems unimpaired. The quality and quantity of the ensilage, in case of a carefully constructed cistern and ordinary care in management, suffers mainly from but one source, — fermentation. The waste of nutritious plant constituents in the silo appears, probably, to most of us large, even ruinous, because we have taken but little pains to find numerical values for the depreciation in the feeding value of our fodder-crops, which our current modes of preserving fodder are liable to permit or to favor.

Preferring actual results to mere approximations, and ascribing, therefore, to the silo system a higher rate of unavoidable waste of feeding value than to any other current mode of preserving fodder, it ought to be remembered that there are some redeeming features connected with the product of the silo, — the ensilage, — for which it will be difficult to find one definite numerical value when comparing it with the dry fodder of the same plant; namely, the silo fermentation increases the rate of digestibility of otherwise indigestible constituents (cellular matter) of the green fodder, and thereby compensates somewhat for the waste of valuable soluble organic matter; and the ensilage of those crops for which the silo system is judiciously recommended is almost invariably more acceptable to all kinds of farm live-stock than the dry fodder.

When we add to the previous enumeration of exceptional advantages arising from the introduction of the silo system the one that it will tend to increase the production of one of our most important fodder-plants, the corn, and that it will enable us eventually to take care of important refuse materials from various branches of agricultural chemical industry, as sugar or starch manufacture, we can but desire that its financial relation to our farm economy should receive the most careful practical investigation. The silo system is not a substitute for existing modes of preserving fodder, but will prove a most valuable assistance to increase our chances of securing larger quantities of good fodder.

Mr. WARE (of Marblehead). The subject that has been presented to us this morning is one that is of exceeding great

interest to us as practical farmers, and one upon which we are desirous of obtaining all the information possible. I would like to ask one or two questions of the professor. I understand, from the several analyses that have been given of the green food and of the ensilage of the same, that there are certain losses, in the ensilage, of valuable qualities; and it has been stated that those losses are owing to fermentation. Now it seems to me that the great object of the silo is to prevent fermentation: that is the only means by which we can preserve the green fodder; and I understand that a silo well constructed, well prepared, and the ensilage properly cared for, will prevent fermentation. I have understood from Mr. Goffart of France, that, after twenty-five years of experience, he has at last perfected the system to such an extent, that fermentation is substantially checked, or not allowed to take place.

Professor GOESSMANN. Mr. Goffart's results merely reduce the degree of fermentation. No man can prevent, at ordinary temperature, the fermentation of vegetable matter once brought in contact with the air, without the use of antiseptics: he can only effect a change in the degree and in the kind of fermentation. Mr. Goffart may have succeeded in suppressing the alcoholic fermentation, yet could not prevent the lactic-acid fermentation, or the milk-acid fermentation, which transforms the sugar into the acid of milk. The alcoholic fermentation changes the sugar into alcohol and carbonic acid. The next step is the oxidation of the alcohol into acetic acid. When air finds no access, the process of fermentation is simply altered, not removed: it is decomposition in another direction. All we can do in preserving from destruction organic matter once removed from its place of growth, is to retard its decomposition: we cannot prevent it. And there comes the disadvantage. It requires skill to reduce that influence to the smallest proportion; but it cannot be entirely prevented. Here we have an illustration of plants being tightly boxed up, packed in the centre of a silo, and kept there for months; and we find eighteen per cent of the organic matter destroyed. Is there any more practical method of excluding a direct contact with air in a more efficient way? It is clearly very desirable to prevent fermentation; but practically it is impossible. All we can

do is to reduce it to a certain lower proportion; and that is all that Mr. Goffart would claim. Probably his translators have not given us his full views. The process of fermentation is so well understood, that it is no longer a matter of controversy. Scientists agree on that entirely. The practical results, at least, are fully agreed upon. We know what becomes of sugar in the presence of nitrogenous matter. We know, that, whenever the cellular structure of a plant is injured (as is the case with the contents of silos in the majority of instances), transformation begins. The soluble nitrogenous matter comes in contact with the saccharine and starchy substances; and what is the effect? The sugar is changed, according to circumstances, either into lactic acid, or into alcohol and carbonic acid, and subsequently into acetic acid; and we find, therefore, in our best-constructed silos, with corn-fodder, acid to a large extent; namely, acetic acid and lactic acid. The former is the result of the oxidation of the alcohol. That is the natural consequence. Fermentation and oxidation are two distinct processes. The one causes the breaking-up of certain substances into compounds of a simpler constitution; as, for instance, sugar breaks up into alcohol and carbonic acid. Nothing is lost from the make-up of the sugar. Acetic acid means the access of oxygen to the alcohol, and the formation of water. Alcohol and carbonic acid are only intermediate processes. Therefore, if we are not careful, we may destroy the contents of the cells as starch and sugar to a ruinous extent. In other words, a silo treatment may destroy fifty per cent of the feeding value of your food. The above-described experiments tend to prove that we cannot prevent the destruction of from twenty to twenty-five per cent at least. Scientists do not agree as to the physiological value of the various compounds produced. In regard to starch and sugar, we know by experience what they are worth in the animal economy: what lactic acid is worth, we are yet in doubt, and what alcohol is worth is still a matter of dispute to-day. We have thus, in one case, compounds of recognized physiological value, whilst on the other side we have a series of products of decomposition without any proof of what they are relatively worth in the animal economy as compared with the substances from which they originated.

There is, therefore, what I call unavoidable destruction in the operation of the silo system, as a partial fermentation is, in practice, still unavoidable.

Mr. Ware. I am very glad of the explanation; but I am sorry to have some of the starch taken out of the ensilage system. It strikes me that the box that has been spoken of, placed in the bottom of a silo, would not be compressed so solidly as a silo well loaded would be. If that is the case, I think it would account for a large portion of the destruction that took place in that box.

Now, in illustration, I would like to state one fact that has come under my own observation, that it seems to me is exactly in the line of this silo preservation. I live on the seashore, and we on the seashore depend very largely upon the ocean for material for fertilizing purposes in the form of kelp. Kelp taken from the seashore, and exposed to the air, will, within thirty-six or forty-eight hours, even in winter, reach a state of high fermentation, and become so warm, that maggots will be produced even in the middle of winter. Now, when we have a large amount of kelp come up on the shore, we go to work and team it up, load after load, treading it down continually, until we have a pile perhaps eight or ten feet high, which becomes very solid; and two or three months after (although it is a substance that will ferment very rapidly, — as quickly as green corn fodder), while the surface of that pile for the depth, perhaps, of ten inches, where it has not been trodden quite solid, will be badly decayed, the remainder of the kelp-leaves are perfect, the color is retained, and it seems to retain all the characteristics of the fresh plant.

Now it seems to me that here is an illustration of the operation of a silo. This kelp has been preserved, if you please, by this system of ensilage, in a perfect condition, with no appearance of fermentation having taken place. It seems to me that the great object in our silos is to follow out this simple illustration; that is, we must fill the silo so rapidly, and tread the green fodder so solidly, and load it finally so heavily, — as I understand, not less than twelve hundredweight to the square yard, — that the air will be expelled; and it will be kept hermetically sealed from the air, so that fermentation cannot take place.

Now I may be mistaken. I have not gone into it, although I have studied the matter carefully; but, if fermentation cannot be prevented in that way, I fear that our system of ensilage is not going to meet the expectations that I, at least, had conceived of it.

Professor GOESSMANN. We apply the name "fermentation" to several changes which are taking place in vegetable matter. We have the vinous fermentation; and alcohol and carbonic acid are its products. We have the slimy fermentation; and lactic acid, a non-volatile acid, is mainly produced. These latter changes are everywhere taking place where nitrogenous matter is mixed with non-nitrogenous matter under limited access of air. They are very serious, and cannot easily be prevented. It is a mere matter of degree. Take, for instance, a simple grape-berry. You can keep that berry by drying it carefully, as is done on a large scale. But take that berry, and give it the slightest laceration with the finest needle you can conceive of, and that berry is gone. From that spot disintegration will take place, and it is only a question of time what shall become of it. It is an illustration of the process of destruction that is continually going on in the world. After life comes death. The moment that cellular system is broken, there is a retrograde movement, and the grape-berry goes back to its elements. So it is simply a matter of degree. I might say, of course, that the changes take place in different directions. In one case, it is lactic acid; in the other case, it is acetic acid. But what does it matter? A change from a valuable constituent of fodder into a constituent of very doubtful value is the result. We shall always find the largest losses in the ensilage in the corn; and, if we should take sugar-corn, it would be still more ruinous, as sugar is a most essential constituent of that kind of corn; and for this reason, ordinarily, the decomposition of the sugar-corn would be far greater than of the common corn.

Mr. CHEEVER. Before the professor leaves the platform, I would like to ask him if our canned fruits do really keep perfectly in glass jars, sealed tight, put up boiling hot, or whether there is fermentation going on in those bottles.

Professor GOESSMANN. When you can your fruit, it being heated up to a certain high temperature, you bring

it up to the point of the destruction of life. Fermentation is due to living organism floating in the air. These living germs, coming in contact with vegetable matter, begin to develop, and will continue to develop just as long as their life lasts. If you heat up any article to be preserved to a point where you destroy the living organisms, and seal it up air-tight while hot, you will fail to find any alcoholic products in that can.

Mr. CHEEVER. Then the two cases of putting ensilage into an air-tight box and canned fruit into bottles are not parallel?

Professor GOESSMANN. No.

Mr. CHEEVER. I suspect that box was filled as tightly as possible. If we know what influences the result, we shall be very careful to exclude that influence; and I suppose the parties considered that very carefully. They knew air was a destructive element, and, if they wanted to obtain a result worth any thing, they adopted a system which they thought would best bring about the result, and excluded air as much as possible. Taking that for granted, is not a tight box in the middle of a silo far better protected than any part of the silo?

Professor GOESSMANN. The only practical way to do it better is to turn in water at a certain stage, and let the water exclude the air. These experiments have, however, not been sufficiently tried to determine what the exact result would be. The water would probably dilute the material so much as to make it worthless.

Mr. WHITTAKER. I should like to ask the professor, in connection with this matter of the exclusion of atmospheric air, a question which I think bears very seriously upon the point. In order to preserve any thing practically, as I understand it, we have either to get rid of the water, or get rid of the atmospheric air. If we retain the water, we must expel the atmospheric air: if we retain the atmospheric air, we must get rid of the water. Now, here is the point with regard to this ensilage business. We fill the silo, and, in filling it, we put in a certain quantity of decayed matter. Can that be avoided? I have always been taught that matter in a state of decay, however small it may be, will carry decay through the mass. It would not make any dif-

ference if the silo was as big as this building, and filled full, if there was a piece of decaying matter as large as my fist in it, it would produce decay in the whole mass eventually. The entire exclusion of atmospheric air will prevent that. But do we exclude atmospheric air from our silos? I do not believe it has ever been done. We fill the silo, and the matter we put in is loaded with atmospheric air. As it goes in, atmospheric air goes in with it. We put our plank on top of it, we weight it down, and we put earth on top in order to exclude the atmospheric air. But we have all the atmospheric air in the silo that was in the material we put in, and, when we compress that, we simply condense the atmospheric air that is in there, and, by condensing it, we render it more efficient to prevent fermentation. Is not that so?

Professor GOESSMANN. Oh, yes, sir! It is only a matter of degree. It is practically impossible to exclude air absolutely. The simple question is, practically, Can we, with a moderate expenditure of time and labor, preserve our fodder in that exceptional way? If a simple mode of operation will not do it, the whole thing is not worth having; but, if a simple mode will accomplish it, it is. There is a partial loss which is inevitable.

Dr. STURTEVANT. In the changes which are taking place, there is a production of carbonic acid gas, which excludes the air to a certain degree. In some cases, certainly, where an opening is cut down into the silo, and a lighted candle dropped in, the candle will be extinguished. This carbonic acid gas in some silos certainly expels the atmospheric air to a certain extent, occupies its place, and stops putrefactive change.

Professor GOESSMANN. There are two processes in operation in fermentation which we have to keep in mind: one is the action of air, and the other is the action of living germs. The exhaustion of the air amounts to very little, as you will understand when you know that one pound of sugar will dispose of all the oxygen in that silo, and leave nitrogen behind. Nitrogen takes its place. The presence of nitrogen excludes air. As Dr. Sturtevant mentioned, if you put a light into the silo, it will go out as quickly as in carbonic acid. Therefore there are two causes which will

dispose of the air. The destruction of the germ-life is a far more important question. That is disintegrating without air: that transforms all the constituents, it changes the sugar, etc., into lactic acid without the aid of air. In our canning system we get the germs out of the air: the heat destroys them. A little air we do not care about. A few grains of sugar will dispose of the oxygen of the air very effectually; but it cannot dispose of the germs that are there. They are living beings, multiplying by millions, and we know that those forces are most powerful. It is that continued multiplication which destroys the plant.

Mr. Whittaker. As I understand Dr. Sturtevant's point, it is, that, as the carbonic gas increased, the oxygen would be expelled; but, if the oxygen cannot get out, I do not know where it is to go. As I understand that the carbonic acid, when formed, is no greater in bulk than the oxygen that is contained in it was before it was converted into carbonic acid, this carbonic acid formed from oxygen will occupy just the same space, and no more, as the oxygen before it combined with the carbon to make carbonic acid. Consequently the atmospheric air would be just as prevalent, notwithstanding it was mixed pretty well up with the carbonic acid. It would not be displaced, but would occupy just the same space that it occupied before it was combined.

Dr. Faxon (of Quincy). Among my labors at the National Sailors' Home, of which I am superintendent, has been the reclaiming a large quantity of salt meadow, part of it covered with black grass, which I cut yearly, and used for bedding altogether. Last May I went to Billerica, and saw the silo of Dr. Bailey, and I concluded that all there was to a silo was the exclusion of air: so I thought I would try the experiment with some of my black grass. I took a lot of old boards, and enclosed one of the end bays in the barn, ten feet by twelve, in the loosest manner, and I put into that all the black grass I cut on two acres and a half of the marsh, and trod it down very thoroughly. I think I commenced on the fifteenth day of June, which was Tuesday, and I finished on Saturday. The grass was cut every day after the dew was off, and put into the bay. On the barn-floor side I put up simply one upright three by three post, and put in the boards. The heat was sufficient to be disagreeable to the

hand, and people said the barn would burn up. When all was in, I put boards on crosswise, and loaded that grass, which was then about eleven feet high, with stones, at the rate of at least a hundred pounds to the square foot, and reduced the pile as much as I could. It sunk at least a third in bulk. Some four or five weeks afterwards — possibly it was not more than three weeks — I commenced on the front side, and took down the boards, and cut off a strip about two feet wide, which had moulded for about three inches in. That fodder was a rich tobacco-color, and, instead of being acid to the taste or smell, it was positively sweet. It had a taste like honey. The flies came to it in swarms. I fed it to my cattle, and, although there was not a creature that would eat this black grass in its original state, they all ate it readily. My cows did not decrease in milk: they kept in just as good condition all through. I fed them almost exclusively on this fodder. I don't believe I gave two pounds of hay a day to the cows. Of course, there was some transformation in the product which rendered that fodder, which before was of little value, of considerable value. I am not going to discuss the question as to whether silo product is worth more than the same product would be if fairly saved in a dried condition. I simply state the results of my experience, that any other man, if he chooses, may try the operation.

QUESTION. How long did the grass remain in the field after it was cut?

Dr. FAXON. It was carried directly to the barn. Probably there was none of it remained an hour on the ground after it was cut. I fed it until midsummer.

I tried another experiment about the same time. I had a box that I had used to steam food in. I begin to cut my grass as soon as it is high enough, and feed it to my cows. I took that box, and put in probably a ton of grass, and weighted it the same way; and at the end of three weeks it had developed quite an acid smell and taste. You could not get any such sweet taste out of it as out of the black grass.

I will mention an experiment with corn-fodder. I had a lot of fodder that I cut in October. It was sowed the last week in July between my potatoes. I marketed the potatoes; and when the frost came, to save that fodder, I made a pit eighty-four feet long, ten feet wide, and fifteen inches

deep, and put the corn in this pit. On the edge of the pit, so as to make them flush with the inside edge, I put up a lot of old posts six feet apart; and I boarded up the sides five feet high, loosely, with hemlock boards. It took nearly a thousand feet. As the fodder was cut when the dew was off, I brought it to the pit and laid it in, butts all one way, lapping the butts as one laps shingles, so as to make the small tops lie with the butts; and I carried that process out the whole eighty-four feet. Not having quite as much as I wanted, I carried down there five large tip-cart loads of fodder that was cut when the corn was, and from which the corn had been husked, and put that on top of the green fodder, which raised it above the boarding: I put on top a little thatch of eel-grass, and threw on fifteen or eighteen inches of dirt. When the mass settled, the acid smell was scarcely perceptible. You could put your hand in five days after the first lot was put in, and the heat was not at all uncomfortable. You could feel it was warm.

Professor GOESSMANN. I can but confirm your observation. The result depends entirely upon the composition of the plant. Grass and clover will produce an ensilage quite different from corn. A plant which has little sugar will act quite differently from a plant that has a great deal of sugar. There is no need of having an acid: it may be even alkaline. The main question is to prevent the change from going beyond a certain point, and injuring the feeding value of the material. Those plants which contain the largest amount of sugar will produce the largest amount of acid: therefore corn ensilage is usually sourer than that from clover or any other plant.

Dr. FAXON. The mass settled down so that it would weigh fifty pounds to the cubic foot. It was a little mouldy at one end for two or three inches; and I shovelled off the dirt, and cut that part out, and I found there was a great deal more acid than there was in the bay of black grass. But the cattle ate that fodder just as well as they did the other, and the increase in milk was quite remarkable. I had been feeding shorts, four quarts, cotton-seed meal and Indian-meal a quart each, daily. I diminished the grain within two days just one-half, and the milk increased one-eighth; and I fed with that about five pounds of hay to each cow per day.

The silo product is not mouldy anywhere. The fodder that was perfectly dry and put on top is eaten up just as clean as can be. By this simple method farmers can preserve their fodder in a moist condition, so that the cattle will eat it all; and they can save labor, because it is much easier to put it in a silo in the field than to cut it up. If you cut it up, it will heat tremendously in twenty-four hours.

I have no doubt but that I shall raise a great deal of corn-fodder, and put it up in that way, simply because it is handy; and we can get more of it in that way than in any other.

I don't know but I should hesitate in regard to putting sugar-corn down in this way, after what has been said about it.

Professor GOESSMANN. It would depend upon at what time it was put in.

Dr. FAXON. I planted some green corn for market, and it gave me a little over twelve pounds of fodder to each kernel. That was the Burr corn. There were eleven thousand kernels to the acre, and that is nearly sixty tons of green fodder. The land had been in grass seven years. I ploughed it up last year to kill the witch-grass out of it. It had been top-dressed nearly every year, and this last year it was manured simply with a very little compost of hen-manure. I planted my corn the first day of May (rows four feet apart, one grain in a place a foot apart); and along in July I cut some of it up for fodder, and got at the rate of sixty tons to the acre. I feed about sixty pounds a day of the corn-fodder. Dr. Bailey says that is sufficient to feed a cow, without any hay: I do not think it is. I feed a little hay, and I think I get a better result.

Professor GOESSMANN. There is a point which needs explanation. Feeding corn-fodder, which differs in its composition from the requirements of the animal to support its life, can only be accomplished by the waste of one or the other constituents of the material. If we feed an article of fodder in which the nitrogenous matter stands to the non-nitrogenous as one to nine, we give, in many cases, more non-nitrogenous matter than the animal requires. For instance, a milch cow requires, according to long-continued experiments, the proportion of one to five and a half, — almost one-half nitrogenous matter more to give you the benefit of the other

half of non-nitrogenous matter: in other words, you waste half. The same is true if you feed green grass alone, or hay alone, or clover-hay alone. The proportion of nitrogenous to non-nitrogenous matter in good clover-hay is about one to three, or one to three and seven-tenths. Now, if a cow needs only the proportion of one to five, you waste a fair proportion of good fodder in that clover-hay. The experiment has been successfully tried to see if we can supplement our hay and clover by straw, or by materials that contain one to nine, or one to ten. Here comes in the question of cheapness of feeding, which the farmer has to study. There is an actual waste of feeding value in feeding the best hay without any addition, under almost any conditions. That fact has been established by practice. The same is true with regard to clover-hay and other leguminous plants. We are just beginning to discuss this important question of rational feeding; and we can never come to a decision, unless we take into consideration, besides the character of the fodder, the particular requirements of the animal. If we feed for sustenance merely and for the production of milk on the same scale, we waste, in one way or the other, our food; and it is necessary for us to learn in what proportion we can economically supplement by lighter and inferior articles of fodder our strong articles of fodder, as, for instance, good clover or meadow hay. It is important to consider the requirements of the animal with reference to what it is to do. A horse to do good work requires a larger relative amount of nitrogenous matter than a horse that stands idle. An ox which is kept through the winter simply for work in the spring can be kept at a far cheaper rate than an ox that is put to daily labor. With us the question remains, how to make a practical application of this fact.

I listened with a good deal of interest to the discussion on feeding yesterday; but, for one, I must say that there is no basis for comparison. Without having any information regarding the quality of the fodder which has been fed, how can we draw any reasonable deduction as to its feeding value? The question of quality is of the first importance. The discussion of ensilage, I think, has come up at the proper time. It may serve as the means of stirring up the fodder question, which needs further ventilation (there can be no doubt about it) as much as the fertilizer question.

Mr. BOWDITCH. I would like to ask what the effect would be upon the fodder if a rain should come up, and it should be wet as it was being put into the silo.

Professor GOESSMANN. It would have no effect whatever. That is one of the great advantages. It renders us independent of the season in regard to those crops which suffer most from exposure.

Dr. WAKEFIELD. We have listened to a very able address from Professor Goessmann on the ensilage system. He has given us the facts in regard to the preservation of fodder in silos which cost considerable money. We have had an experiment given by another doctor, which any of us can try. It is within the means of anybody here who raises corn to try the experiment, because all he has to do is to plough up his land, and make his silo in the field. I am very much interested in this last process, because it comes down to my means, and, I think, to the means of all of us. I do not see why, from his description, the fodder is not preserved substantially as well as in the expensive silos. He says his cattle eat it readily, and he says his milk keeps up. Those are the two things that we want. The professor has stated here what is lost and what is gained by the silo, and he says that it is necessary to exclude the air; and the question is, How much shall be excluded? We cannot go into the process of extracting the air by an air-pump; but, if we can exclude it sufficiently by piling up some rough hemlock-boards at an expense of something like fifteen or twenty dollars, we can afford to do it if we can obtain a feed, which, in the main, answers the purpose just the same as if we had an air-pump in operation, and pumped all the air out, which would be too expensive a business for us to engage in.

It seems to me that this experiment is of vast importance to us. We have heard what the professor said here about experiments in Germany and France, and the experiments which are made in silos which cost a great deal of money. If we can have the same advantages, in the main, without so much expense, then there is a great amount gained. Now, this ensilage that Dr. Faxon has brought here looks like tobacco; but if his cows don't call it tobacco, and will eat it, and give milk in proportion, it does not make any difference

whether it has turned green, or gray, or dark-colored. We want the facts in the matter, so that we may know whether we can get the benefits of this system without too much expense. Here is a chance, I conceive, to try the experiment. He has tried it on a cheap scale, and we can all try it in a similar manner.

Dr. FAXON. I wish to say that there is one thing which might make this cheap process of preserving fodder of value. It is very easy for us to buy oil-cake, or any nitrogenous commercial article; but if we can raise forty, fifty, or sixty tons of corn-fodder on an acre, and by that means keep four or five cows in the barn, and put the manure on the ground, it will enable us to use a good many acres that are of no value now. That is the point we are after. I will not take issue with the professor on the loss; but the question is, How much shall we gain? If we have land that does not bring in net five dollars an acre, if we can make it yield fifty dollars an acre, there is so much gained. That is the only practical point there is about it. It enables us to save fodder that we could not save in any other way.

Mr. JOHNSON (of Framingham). I suppose the matter of dollars and cents is to come into this silo question, and therefore I venture to speak of the cost of preserving field-corn. To take sixty tons of green corn and cut it up into pieces an inch long, and put it into silos, is very expensive. I think Dr. Faxon has demonstrated thoroughly that corn can be kept in the inexpensive way he has described. Now I wish to state, that in 1866 or 1867 I packed a bay of hay that was not in the field over an hour from the time the scythe dropped it. The timothy was not in full blossom when it was cut. I packed it so that it was all laid even and straight through the mow, and kept it as nearly air-tight as possible. The barn had no cellar. The hay was packed close to the ground, with plank underneath. That hay was thoroughly preserved. It had a fine brown shade, and was the sweetest and best hay for milch cows that I ever fed. I could not put in my hay where there is a cellar underneath in that way. That hay was, as I have said, thoroughly preserved, except about a foot in depth, which could not be kept as tight as the rest of the hay in the mow. I am confident that the gentleman's theory is correct, and his experi-

ment is correct every way; and hay may just as well be kept dried in that form, as dried three or four days, and lose half of its value.

The CHAIRMAN. Why didn't you go on getting your hay in that way?

Mr. JOHNSON. I did, until I got a cellar under my barn.

Mr. SIMONS. The last gentleman who spoke left the inference on my mind that he thought the drying of hay was injurious. I understood the professor that drying did not injure it.

Professor GOESSMANN. No crop loses in its feeding value by careful drying. It is the only process by which the ordinary feeding value of grass may be preserved entirely. The making of brown hay, as Mr. Johnson has described, is a practice which is carried on, to some extent, here and there, and when we cannot dry our grass it comes in as a great help; that is, the loss is not as great as in a silo. But it is more difficult, and I suppose will be found more difficult to manage successfully than the management of a simple silo.

Mr. WILLIAMS. What effect does falling dew have?

Professor GOESSMANN. The falling of dew is not of any particular consequence.

Mr. WILLIAMS. Then there is no disadvantage if we do not cock our hay up at night?

Professor GOESSMANN. I have never seen any evidence of it.

QUESTION. Is there not always a loss when hay is stored damp enough, so that sufficient heat is generated to change its color?

Professor GOESSMANN. Yes, sir: there is no doubt about that. Heat indicates a chemical transformation, a change of valuable material, no doubt. The difference between brown hay and ensilage is a mere matter of degree, nothing else. If brown hay is well managed, the production of it undoubtedly saves more than the production of ensilage will. But as I understand, and general observation tells me, it is more difficult to prepare brown hay of good feeding qualities than to prepare good ensilage.

QUESTION. Is it possible, in getting in hay that is not thoroughly cured, to tread it solid enough in the mow to preserve it any better than if it is not trodden down? Can you exclude the air by that operation?

Professor GOESSMANN. Yes, sir: quite sufficient to reduce it to the smallest quantity. You will find the outside portion of the hay injured rather more than the interior part, because that affords a freer passage for the air.

Dr. FAXON. A gentleman just asked about putting in hay green to make brown hay. It should be known that it is not necessary to dry hay a great deal. I will relate an operation of mine, simply to show you how a large mass of partially dried green fodder can be put in. Some seven year ago I mowed about ten acres of Hungarian grass, mixed with wormwood: it was almost as thick as it could stand. I finished cutting it at night, and left it until the next morning. The next day that stuff was as green as it could be. There was certainly as much as twenty tons of it, two-thirds or more wormwood. I made a stack of it, thatched the top, and it steamed there until February. I did not cut that down until August, the second year after; and there was not a brown straw in it: it was just as dry and fresh as it could be, showing that there was not enough water left in the stack to produce any organic change, or else that it all worked off in steam. That was the best lot of hay I ever saw of that kind. There was not a foot of it at the top damaged.

Major EMERY (of Lowell). I certainly, for one, have felt more pleasure, and been more benefited, by this lecture, than by any paper or any lecture I have ever heard or read since I have been in the farming business. It seems to me that either chemistry must go under, or this silo business. I think chemistry has done more for farming than any thing else of late years. I think it has taught us more in the right direction, and in the end will produce more. It will revolutionize most of our modes of farming.

I have discussed this same subject with Dr. Bailey at Billerica; and, to show you how people look over the surface, I will name one thing that came up. He took the ground that fermentation created and brought out the sugar, which is entirely different from the fact. I took the ground that fermentation brought out the alcohol. Now, we have had the yellow-fever in the West, and we have had a commission of the Board of Health to look after it, and see if there cannot be a stop put to it. We have had the small-pox in many

places, and we have had the Board of Health after that. Now the American people have the disease of silo on the brain; and we have a man here who has, I think, shown you the merits of it. I hope that the State Board of Agriculture will print this address in some form, so that every man who has silo on the brain can read for himself, and make up his mind whether he will have a silo or not; whether he will go according to the facts as given us by chemistry, or whether he will take the thing that first strikes his mind, because his cows appear to do a little better, and perhaps, the first week, will yield a little more milk. I think the lecture to which we have listened is worth more than any paper that was ever put out by any agricultural society; and I hope that it will be published in such shape, that every farmer who can read and understand will know the exact benefits or disadvantages from excluding the air from this green food. I am not a chemist, and I do not know whether the ground taken by Mr. Bailey is right or not; but, when I have a piece of timber that I want to use, I turn it over to see if there is not a knot on the under side. I hope the people will look this matter over very carefully before they spend any money.

Capt. MOORE. I would like to ask Professor Goessmann whether, in his judgment, there has been any improvement over the old plan of "making hay when the sun shines."

Professor GOESSMANN. No: I stated that most distinctly. There is no improvement over that method if the weather is favorable; but, as I said, the system of ensilage will be an assistance in saving, in many instances, a large quantity of valuable food. In unfavorable seasons it will undoubtedly prove very valuable to the farming community, under proper management. I think simple ditches will do. It is not necessary to have expensive masonry in a silo. A pit, if lined with boards to prevent leakage, will do as well on a moderate scale. The only difficulty about a silo made in the ground, and unlined, is, that a large amount of the soluble portion of the material will be apt to leak into the loose soil. I stated that in one case fifty per cent of the value had been lost by simple leakage in the ground. What we want to preserve is the nutritive portion of the fodder: and, if any part of it passes into the ground in form of a solution, much is lost; for the solution contains the most valuable portion of

the fodder. It is for this reason not the proper thing to construct a silo in loose soil. It would be far better to line it with some suitable material, and use it year after year for the same purpose.

Mr. WHITTAKER. I want, before this meeting dissolves, to submit a resolution; and I would like to state the reason why I submit it. When it was first announced that the Board of Agriculture was to hold its annual session in Southborough, there was a good deal of criticism elicited in connection with it. It was thought highly preposterous to make the attempt to hold this meeting of the Board in a small place like Southborough, where there was not a hotel within four or five miles of the town; and how we were going to manage it, and how we were going to get an audience to listen to the addresses that might be delivered, was a question that nobody could solve. When I came here the other morning, I supposed the meeting commenced at the usual time, ten o'clock; and I got here about eight, in order to be present at the opening of the meeting. It seemed to me a remarkably quiet place. It was so quiet, I could not get away from the idea that I had made a mistake, and come up on Sunday. But that is not the point. At a great many meetings of the State Board previously, it has been supposed that it was necessary to go to some populous centre in order to get an audience. This delusion has been dispelled in Southborough. As I understand, the population of this town is not much over twenty-five hundred. We have had very stormy weather. Yesterday was an exceedingly stormy day, and yet this hall was full. I do not know what we should have done, if it had been a pleasant day, so that people could get here. This hall certainly would not have been large enough to hold the audience. There are ladies enough in Southborough interested in this matter to fill this hall if it had been a pleasant day. They have been interested enough, small as the place is, to feed us, and feed us well. I do not know that we were ever better fed, better entertained, or better cared for in every respect at any place, however large.

Now, Mr. President, I submit this resolution: —

Resolved, That the guests of the State Board of Agriculture desire to express their thanks to the board for holding this meeting in a strictly agricultural district.

The resolution was adopted.

QUESTION. I would like to ask the professor one question: What, in his judgment, would be the effect upon domestic animals of eating the product of a silo day after day, and week after week, through the winter? Whether it would induce any disease in the stock? That is a serious question to my mind.

Professor GOESSMANN. Feeding exclusively ensilage in large quantities is not to be recommended. It ought to be supplemented, without doubt, in many instances, with some other stronger article of food. Ensilage contains frequently a large quantity of acid, and I should recommend that it be supplemented by something else to counteract the effect of the acid. For instance, give forty pounds of ensilage, and supplement with some hay, and similar, even stronger articles of fodder from time to time. No one article of fodder can be used economically for all kinds of animals in different conditions, with equal advantages.

The CHAIRMAN. Before dissolving this meeting, in behalf of the Board of Agriculture I desire to express again our great gratification at this large and most intelligent audience. The meetings have been larger and better and more successful, I think, than any of the country meetings I have ever attended; and, while we feel thankful for our kind reception here, we certainly ought to thank you, in behalf of ourselves and our speakers, for the close attention which you have paid to the papers; and I believe you will be rewarded for this in the present, and still more when you receive the Secretary's Report.

And now, in behalf of the Board, I bid you farewell, and hope for a happy return to your homes.

CATTLE COMMISSIONERS' REPORT.

To the Honorable Senate and House of Representatives of the Commonwealth of Massachusetts.

During the past year, as in 1878 and 1879, the duties of the Commissioners on Contagious Diseases among Cattle have principally consisted in combating the disease known as "glanders" in horses, and, it is believed, with some measure of

success. The whole number of cases disposed of in 1879 by killing the infected animals was forty-two: the present year it has been but twenty-seven, and the number of suspected cases requiring watch or isolation has decreased. In their last Annual Report the Commissioners called the attention of the Legislature and the public to the several forms of this disease, to its contagious, fatal, and insidious character, and the great danger to our horse-stock, as well as to man, by its prevalence. We desire herein to call attention to those statements; for, although the number of cases has decreased the past year, the disease is very far from being eradicated, and constant care and vigilance will be required to keep it from increasing, or even to keep it under control. The provisions of law relating to this disease are such as to make the expense of combating it unnecessarily large, and the principle involved rarely finds expression in the statutes. A glandered horse is a nuisance, and dangerous to the owner and the public; but the law requires, that, before being slaughtered, the condemned animal shall be appraised for the benefit of its owner, and by such a specific method, that, quite generally, the bare cost of appraisal is more than the sum awarded. The Commissioners would respectfully suggest such a modification of the law as will secure the suppression of individual cases of this nuisance in a similar manner to that by which others affecting the public health and safety are suppressed. In our last report the fact was cited that contagious pleuro-pneumonia existed in several States of the Union; that there was imminent danger that it would spread to all our herds, and reach the great cattle-producing regions of the West; that there was a marked feeling of apprehension and unrest among all interested in cattle production and commerce; that the country was threatened with a total loss of our beef-trade with Europe, and of immense losses of stock by its existence. There has been little if any change in this matter during the present year; and there is not, as we are aware, any comprehensive organized plan in existence for its suppression.

In consequence of this fact, the English Government has caused the slaughter of all American cattle at the place of landing; and, it being reported that among them animals were found infected with the disease, the United-States Gov-

ernment appointed Dr. Charles P. Lyman of this State as a commissioner to visit that country, and, if possible, ascertain by personal inspection the facts in the case. Dr. Lyman has performed the duty assigned him, and his official report is in the Agricultural Department at Washington, awaiting publication. The English officials having expressed a suspicion that some of the cattle supposed to be dangerous were from the West, though shipped from the port of Boston, and as similar cattle were daily slaughtered at Brighton, and yarded there in contact with other stock, and needing more positive information on the subject, we deemed it our duty to co-operate with Dr. Lyman in the examination of the lungs of these animals. At this date about one thousand pairs have been examined; and, though the work is temporarily suspended, it will soon be resumed, and, when sufficiently extended, the result will be made public. In view of all the facts respecting this cattle-plague, both at home and abroad, we feel constrained to renew the recommendation in our last report, that the government of the State notify the General Government, and the governments of all the States endangered, of its readiness to co-operate in general measures for its complete extermination. Owing to a prevailing feeling that we are liable to an outbreak of contagious pleuro-pneumonia, or from ignorance of its mode of propagation, the Board are frequently notified of supposed cases of this disease; but they have always proved to be simple lung-fever, or tuberculous consumption. Some of these cases are very severe and fatal, and cause no inconsiderable loss to stock-owners. A narrative of one of them will suffice for all, and may indicate some of their causes and means of prevention. Early in October we were notified by the selectmen of Grafton, in Worcester County, that cattle at a designated locality in that town were suffering from a supposed contagious disease. Visiting the farm, we found a large herd of generally very fine-looking and highly prized cows. The owner informed us that some of them had indicated disease for many months. One had already died; two more were much emaciated, and probably past recovery; and three or four others coughed more or less severely. The symptoms of the sick animals were such as might exist in the contagious form of the disease; but the herd had been on the farm a long time, and it was not known

that any of them had been in contact with or infected by cattle from abroad. To make the matter certain, one of the sickest cows was appraised and slaughtered. Both lungs of the animal were found packed and solidified with tubercles; but there was an entire absence of those peculiar tissue characteristics always found in the contagious form of lung-disease. The facts elicited by careful inquiry respecting the history of the herd and its management satisfied the Commissioners that the disease was engendered on the premises. There were about forty animals in all, practically in one stable, and, except in the daytime in the summer season, they had little exercise in the open air. Throughout the cold portion of the year the stable was closed front and rear; the barn-doors were shut at all times; and in the coldest weather the temperature of the stable was maintained at between sixty and seventy degrees, and practically no ventilation provided. In all other respects the herd was cared for in the best manner; but, in the opinion of the Board, proper sanitary conditions had been systematically disregarded for a long time, and this was a sufficient cause for the condition of the herd. The fact that this disease had been found in three or four isolated localities within the last year has been the occasion of much excitement and alarm by sensational statements of its contagiousness. That it is so, the best authorities are not agreed. Youatt, in his work on cattle published in 1840, says, "Animals which exhibit decided symptoms of consumption should be removed from the dairy, not because the disease is contagious, but because it is undeniably hereditary." Recent experiments have been made to test the contagiousness of tuberculosis, both by inoculation and the ingestion of tuberculous matter; and Fleming says, "The facts elicited affirm that it may be thus communicated." Several investigators in this direction have failed to produce corroborating results, and others say that no results have yet been reached of any value in this direction.

The question of the contagiousness and virulence of tuberculosis is still under consideration, and further researches are necessary to elucidate and establish certain important points respecting it. We have, therefore, declined to consider it within the intent of the law which prescribes our duties and obligations. During the excitement occasioned by the sup-

posed prevalence of this disease, a report reached the Board of Agriculture, that the cattle on the Agricultural College farm at Amherst were infected with it. And the members, in their capacity of overseers of the college, passed a resolve requesting the Commissioners to make a careful examination of the stock and its condition. Complying with this request, Dr. E. F. Thayer, the veterinarian of the Board, made the examination, and reported to the overseers that "the appearance of the animals, without exception, was that of perfect health. Not one could be found that required physical examination: percussion and auscultation were tried on one without eliciting other than a normal and healthy condition." On the 21st of October a communication was received from the Cattle Commissioners of Rhode Island, giving notice that an alarming disease existed among the cattle on the farm of a Mr. Jenks of Cumberland in that State, caused by a drove of calves (forty-seven in number) purchased by him of H. O. Goodenow of Brighton in this State. This was followed by another on the 23d, stating that the disease was considered contagious, that the Commissioners had taken possession of the herd, and that all which did not previously die would be slaughtered on the 25th, and inviting our Board to co-operate in an examination of the animals. The invitation was accepted by two of our number, and, though thirty-five of the animals were dead on their arrival, two were killed for the examination. The bronchial tubes of these were found filled with parasitic worms, and these were unmistakably the cause of the death of most of the herd by suffocation. This is a disease not unknown to veterinary science, though rarely encountered here, and some information respecting it may be of public utility. It is called "hoose," or "verminous bronchitis," and may exist in calves, lambs, and pigs. Youatt says of it, "In some years this epidemic disease destroys a great many cattle. In the winter of 1830 and the spring of 1831 thousands of young cattle perished in every part of the country. Some of them were carefully examined after death, and the membrane lining the windpipe was found to be inflamed, and the inflammation extending down to and involving the small passages leading to the air-cells of the lungs, and the passages filled with worms." Professor Williams writes, "This

disease prevails in low-lying districts, on land near rivers, more especially after heavy floods, and is mostly seen in the months of August, September, and October, and in calves less than one year old, but very rarely in those rising two years old." The seat of the irritation is indicated by a bronchial cough. There is a loss of flesh, a varying degree of constitutional disturbance, and death by suffocation, if the animal is not relieved. By an examination of the mucus which the sufferer coughs up, the parasites may be discovered. Bronchial irritation occurring in calves during the summer or autumn should be looked upon with suspicion, and its source thoroughly inquired into. If the calves should die, a careful *post-mortem* examination ought to be made in order that the pathological condition of the lungs can be determined. If death does not ensue, the mucous discharge from the nose should be examined, when, in all probability, some of the parasites will be found. The infected animals should be removed from contact with the healthy, not because the disease is contagious in itself, but because the parasites, or the ova discharged by them, are liable to gain access into their bodies, where they multiply, and the trouble is extended. The healthy animals should be placed in high, dry pastures, and not allowed to graze on land which has been occupied by the sick; for the parasites live a long time, though the probable period is not determined. In treating the disease, the animals should be warmly housed if the nights are cold; and inhalations of chlorine or sulphurous acid are recommended. If it is carefully done, the sufferers may be kept surrounded with an atmosphere saturated with either of these acids for fifteen minutes each day, until the trouble disappears; but two or three inhalations are generally sufficient.

If inhalation is objected to, turpentine may be administered in gruel daily, or, what has often been found efficacious, from ten to twenty minims doses of Schule's hydrocyanic acid with carbonate of soda; and some bitter stomachic, as gentian or chamomile, may be given twice a day. The animals affected with this disease, of which mention has been made, came from St. Lawrence County, New York: they were in the Brighton yards but two days; and, as no cattle within our jurisdiction have developed the disease, it is to be

presumed they escaped contamination. We have frequently been notified during the year by town-officers of supposed cases of Spanish fever, hog-cholera, and other diseases; but investigation has shown them to be of a different type, and not contagious. A case of this kind occurred on the 10th November at Taunton, when Mr. Evander Pray informed us, that, of a drove of swine in his possession numbering twenty, twelve had died, and others were affected. A visit to the place, and an examination of one of the dead animals, proved that the disease was identical with that of the calves in Rhode Island, and of which mention has been made above. With the exception of glanders, no disease of that kind has come to our notice; and notwithstanding the many isolated cases of common sickness among cattle, and a mild form of epidemic in horses, the domestic animals in the State have been generally healthy, and its stock interests, whether they relate to the animals themselves or their products, have been unusually prosperous. The sum appropriated for the purposes of the Commission for the year was two thousand dollars. There has been expended of this sum in bills paid or now due $1,693.10, leaving an unexpended balance of $306.90, — a sum, in all probability, too small for the requirements of the year to come, if effort in the ordinary work of the Board is to be continued, but especially so if there should be an outbreak of contagion among cattle, a liability of which there is great danger in consequence of the immense transportation of stock through our territory from every part of the West.

LEVI STOCKBRIDGE,
E. F. THAYER,
H. W. JORDAN,
Commissioners on Contagious Diseases among Cattle.

BOSTON, Jan. 7, 1881.

ANNUAL MEETING OF THE BOARD.

The Board met at the office of the secretary, in Boston, on Tuesday, Feb. 1, 1881, at twelve o'clock, his Excellency JOHN D. LONG in the chair.

Present: Messrs. Anderson, Baker, Bowditch, Goessmann, Grinnell, Gleason, Hadwen, Hersey, Herrick, Lane, Lynde,

Mayhew, Moore, Nichols, Pierson, Sessions, Slade, Taft, Varnum, Wakefield, Ware, Warner, Wheeler, and Wilder.

Voted, To adopt the order of business of the last Annual Meeting.

Voted, To appoint a committee of three to examine and report upon the credentials of new members, — Messrs. Varnum, Wakefield, and Wheeler. Mr. Wilder then took the chair.

Reports of delegates to the Agricultural Fairs being next in order, —

Mr. Demond reported upon the Essex Society (read by the secretary); Dr. Lynde, upon the Middlesex; Dr. Nichols, upon the Middlesex North; Mr. Wheeler, upon the Middlesex South; Mr. Hadwen, upon the Worcester Northwest; Mr. Herrick, upon the Worcester South; Mr. Warner, upon the Worcester North; Mr. Mayhew, upon the Worcester West; Mr. Gaylord, upon the Worcester South-east; Mr. Slade, upon the Hampshire; Mr. Bowditch, upon the Hampden; Mr. Baker, upon the Hampden East; Mr. Anderson, upon the Union; Mr. Gleason, upon the Franklin; Mr. Moore, upon the Deerfield Valley; Mr. Grinnell, upon the Berkshire; Mr. Taft, upon the Hoosac Valley; Mr. Wheeler, upon the Housatonic; Mr. Perkins, upon the Plymouth; Mr. Varnum, upon the Hingham; Mr. Sessions, upon the Marshfield; Mr. Hersey, upon the Nantucket; Dr. Wakefield, upon the Martha's Vineyard. These reports were accepted.

Professor Goessmann then presented his Seventh Annual Report

ON THE IMPROVEMENT OF THE SALT-MARSHES IN THE TOWN OF MARSHFIELD.

The past season has been an unfortunate one for the agricultural industry carried on upon the reclaimed marsh-lands, on account of a severe drought during the earlier part of the season. Whenever the drainage of the lands has been neglected, the salines of the concentrated soil-water showed themselves on the surface, preventing most effectually the growth of any valuable vegetation. Upon the lands where,

in previous years, the grass-seed had been sown upon the old sod, much grass was destroyed in consequence of the increasing spongy condition of the old sod, and its separation from the moist lower soil-mass caused by shrinkage. The loss from this cause proved, for obvious reasons, more disastrous than in preceding years. Lands which had been ploughed and thoroughly worked before seeding or planting suffered much less. Somewhat over one hundred tons of good English hay have been raised during the past year.

The principal crops besides grass have been oats, rye, corn, and onions. Of the latter, seventeen hundred bushels were raised: one acre produced about five hundred bushels; while much of the seed failed. The corn-crop amounted to four hundred bushels.

But little progress has been made in draining. More new lands, however, have been ploughed than in any one previous year since the reclamation of the marshes. Dr. S. Henry has ploughed about twenty-five acres; Mr. J. S. Ford, for himself and others, about thirty acres; and Mr. J. H. Bourne, a similar number. The early frost checked the progress. Holbrook's swivel-plough was used for ploughing, and Randall's harrow for harrowing, followed with the drag.

A considerable portion of the *old land* has been sown to grass, and the balance reserved for corn and onions. The newly broken soil will be sown to rye and oats.

No permanent material changes in the ownership of the marshes have taken place. A lot of twenty-seven acres has been purchased by an outside party for raising vegetables for the market.

We believe the community never had more confidence in the richness and the fertility of the soil than they have to-day. The proprietors, as a rule, have never had more faith in the results of the enterprise, as far as remunerative crops are concerned, than now. Evidently, nothing but a favorable final decision in the courts is needed to secure outside capital for more general and rapid development of the agricultural resources of the reclaimed sea-marshes at Marshfield, Plymouth County, Mass.

C. A. Goessmann.

This Report was accepted.

Dr. Lynde and Mr. Moore submitted reports on behalf of the Examining Committee of the Agricultural College; Dr. Lynde reporting upon the examination of the graduating class, and Mr. Moore upon the condition of the farm.

REPORT OF THE BOARD OF OVERSEERS.

The Committee appointed by the State Board of Agriculture to examine the Agricultural College ask leave to submit the following report: —

We assume that the Board desires something more than a mere report of the graduating exercises of the students, and with that view we have carefully examined other departments and the working of the college.

The members of this Committee have visited the institution at various times the last year; and some of us have watched its progress, from the time it was founded to the present time, with a great deal of interest.

The Act of Congress passed in the year 1862, donating public lands for the purpose of founding colleges to benefit agriculture and the mechanic arts, was a noble act; and it will live in history as a monument of the wisdom of our government, which, in the dark days of the war, had the foresight to encourage that great interest lying at the foundation of all national prosperity, and in comparison to which any other interest sinks into insignificance, and the product of which is to-day paying the national debt.

In 1863 the State of Massachusetts accepted the offer of the United States, and incorporated the Massachusetts Agricultural College, and with its proverbial liberality has given it, at different times, between two hundred and three hundred thousand dollars.

All new enterprises cost more than well-settled projects. The Hoosac Tunnel cost the State some twenty millions of dollars, and, as an engineer has said, fifteen millions to find out how, and five millions to make it. Like all new enterprises, it costs more to find out how than it does to do it: our college is not an exception to this rule.

The establishment of an institution for the purpose of teaching practical, and we may also say theoretical, agriculture, was an experiment in this country. There were no trained instructors who could teach the art of producing crops in the

greatest perfection, nor the natural sciences relating to the animal or vegetable kingdom, the true knowledge of causes and effects, and the laws of nature, which, we may say, is science applied to agriculture.

All these difficulties we have had to contend with. Is it any wonder, then, that mistakes have been made? And these mistakes have not been in the college itself, but, like the tunnel, in developing how the best work can be done.

FARM.

We found last June that the fields of grass were looking in a fair condition, and the corn about the same, and that there was about the usual amount of each harvested in their season. The means at the disposal of the trustees of the college are so limited, that they are unable to make the improvements on the farm which would exhibit to the farmers of Massachusetts those evidences of improved and progressive agriculture which they would have a right to expect on a model farm of the State.

The policy adopted by the trustees in the year 1880, in regard to the farm, was to sell the hay, and also a part of the stock. This course reduces the quantity of manure to be applied to the land, and therefore necessarily impairs its power of production of future crops, unless an equivalent be returned in some form to the soil, which, we are informed, has not been done. A long continuance of cropping without manure means sterility.

We do not mean to censure any one for this, — the circumstances in which the finances of the college were unfortunately found may have rendered it necessary to pursue the course which was adopted, — neither should we expect the farm to pay, as it is termed. A student in chemistry, to acquire even a small amount of knowledge, has to work out under his teacher his problems in the laboratory, which must be thoroughly equipped so as to give the best instruction. Why? Theoretical chemistry seldom makes a chemist: theoretical farming never makes a farmer. The student — after receiving the theoretical knowledge as to raising crops, and the management of every thing pertaining to the farm, which, we think, is well taught here — should be required, as a part of his course of studies, to do all the operations

required on the farm, so that he may fully understand, practically as well as theoretically, what farming means, to the end that he may make a farmer that will be competent to instruct in that branch in any institution, or, by his example on a farm, to elevate and adorn the great business of farming.

This requires a teacher on the farm itself, — one who is competent to instruct any student how to plant and cultivate all kinds of crops, the management of stock, the use of tools, and to economically manage and improve a farm.

HORTICULTURAL.

We found the plants in the greenhouses in as good condition as we could expect. These houses (or rather the large house) are not so constructed as to be economical in their running expenses. In fact, a house costing one-half as much would accommodate as many plants, could be run at one-half the expense, would grow plants better, could be used to illustrate in the teaching just as well; and we only wonder that Professor Maynard has succeeded so well in growing plants under such difficulties.

In the gardens and pleasure-grounds we found every thing neat, orderly, and in good condition. The nurseries, seedling trees, etc., were promising, all looking well, and showing evidence of good cultivation.

The orchards of apples, pears, and peaches, were in an unsatisfactory condition; some of the trees growing well, while others were stunted and dying. There was only a very small crop of fruit in the vineyard. No method of pruning seems to have been adopted, and here was where we would like to have seen the various methods of pruning grapevines illustrated: it would involve no particular trouble or expense, and would be practical teaching to the students, and also to the public who visit the college.

CHEMICAL DEPARTMENT.

As usual, the laboratory and every thing connected with this department was in perfect order. The researches of the able gentleman at its head have been of great value to the farming interest of our State as well as to the college itself; and his methods of imparting knowledge to his classes are said to be admirable.

In all of the recitation-rooms every thing appeared to be going along properly. In the examinations the students displayed a great interest, and appeared well.

The president is enthusiastic, and works hard to make all departments of the institution a success, and as a teacher of theoretical agriculture hardly has his equal.

FINANCIAL.

There has been an improvement in the financial exhibit of the college.

For the first time in its existence it has lived within its means, and has a balance in its treasury. The outlay needed for repairs, however, would probably absorb all of this balance.

It is economy for the State to keep the college buildings in good repair, and there is great need of it at the present time. One of the large buildings occupied by the students was apparently finished with unseasoned lumber, and, although nearly new, is almost unfit for use, and will require a large expenditure to put it in a proper condition for the suitable accommodation of the occupants.

We know that the college is in need of more money. One great mistake has been, that the management have endeavored to do more than their means would allow. And, as a rule, we should say, —

1st, That the college should not incur any debts.

2d, That the teaching should be directed to the exact purpose for which the college was founded; viz., to support one college where the leading object shall be to teach such branches of learning as are related to agriculture.

3d, The farm. No more acres should be cultivated than can be done in the very best manner, to the end that such cultivation may illustrate practically, to the students, advanced and progressive agriculture, and also compel the respect and admiration of visitors in the actual working of the farm.

All of which is respectfully submitted.

JOHN B. MOORE.
A. P. SLADE.
M. I. WHEELER

REPORT OF COMMITTEE.

The Committee appointed by the Board of Agriculture to visit the Agricultural College, and examine the senior class in agriculture, attended to that duty June 23, 1880.

Only one member of the Committee reached the college in the morning in season to participate in the public exercises as advertised; and Mr. Benjamin P. Ware of Marblehead, a member of our Board, and W. L. Warner of Sunderland, president of the Hampshire Agricultural Society, very kindly assisted your Committee in the examination.

The class was small in numbers; but we hope and trust that this deficiency was more than compensated for in the quality of brain, culture, and acquirements of the young men.

The public examination continued for two hours, embracing a variety of topics: such as soils, their composition, origin, varieties, characteristics, adaptations, the methods and effects of tillage;

Plants, their structure; organs of plants and their offices, their composition, and the sources from which the materials of their structure are obtained;

Soils and plants, the effect on the soil of natural plant-growth, and the effect of artificial production;

The conditions of an exhausted soil, fertilization of the soil, agents and substances employed for this purpose, how obtained, and their influences on soils and plants;

Farm management, economy, and accounts; selection, division, and cropping of a farm;

Growing grain as a market-product, and its effect on the farm;

The influence of agriculture on national character, wealth, and prosperity; and several other topics.

The young men acquitted themselves very creditably, showing that they had been carefully and thoroughly instructed in general principles, answering questions readily and intelligently, expressing their thoughts in good English, clearly, properly, concisely.

Essays were submitted for our examination, written by the class in the presence of President Stockbridge, without the aid of books, upon topics given out by him at the time.

The merits of these papers, together with the oral examination in the morning, were to determine the award of the Grinnell prizes of fifty and thirty dollars.

That of fifty dollars was awarded to Almon H. Stone of Phillipston, and that of thirty dollars to William G. Lee of Amherst.

Your Committee were present at the rhetorical exercises of the other classes, and the graduating exercises of the seniors in the presence of his Excellency Gov. Long, the trustees and faculty of the college, and the public. We also witnessed the military drills, and observed the deportment of the young men in their intercourse with each other, the faculty, and visitors; and it gives us much pleasure to express our appreciation of their gentlemanly bearing and refined manners, and the respect, good will, and esteem they manifested towards President Stockbridge and the faculty of instructors.

We fully believe that the institution is doing good, faithful work in the line of practical education for the duties of the field and laboratory, and also fitting its young men for military service and the varied duties of citizenship; and we trust the time is not far in the future when a larger share of that public confidence which is the support and most powerful incentive to high attainment of all institutions of learning recognized and fostered by the parental care of the State may be more generously extended to this young college; filling its halls with students; securing from its friends and from the State a more ample pecuniary endowment: enabling its board of management and faculty to provide more perfect courses and appliances of instruction, and to enter new fields of investigation and experiment; enlarging the boundaries of human knowledge, and devising new and improved methods of employing the vast productive forces of nature and civilization, and thus elevating the laborer by relieving him of drudgery, giving intelligent direction to his powerful energies, while securing to him those results and rewards that can only be achieved in any department of human industry by the exercise of skill based on the possession of scientific knowledge.

JAMES P. LYNDE,
For the Committee.

JAN. 10, 1881.

Report accepted.

Voted, That the secretary be ordered to petition the Legislature for a revision of Sect. 1, Chap. 66, of the General Statutes, so that the the Board of Agriculture may have power to withhold the bounty of the Commonwealth from agricultural societies at its discretion.

The Board then adjurned to ten o'clock on Wednesday.

SECOND DAY.

The Board met at ten o'clock A.M., Mr. GRINNELL in the chair.

Present: Messrs. Anderson, Baker, Bird, Bowditch, Goessmann, Gleason, Gaylord, Goodrich, Hadwen, Hersey, Herrick, Lane, Lynde, Mayhew, Moore, Nichols, Pierson, Sessions, Slade, Smith, Taft, Varnum, Wakefield, Ware, Wheeler. and Wilder.

The Committee on Credentials of newly elected Members submitted the following

REPORT.

The Committee on Credentials respectfully report that they find the following duly elected: —

JAMES S. GRINNELL	appointed by the Executive.
BENJAMIN P. WARE (Marblehead) . . .	by the *Essex Society*.
S. B. BIRD (Framingham)	" *Middlesex South*.
O. B. HADWEN (Worcester)	" *Worcester*.
E. C. FARNSWORTH (Templeton) . . .	" *Worcester West*.
GEORGE JEWETT (Fitchburg)	" *Worcester North*.
E. H. GOODRICH, Jun. (Hinsdale) . . .	" *Highland*.
ARTHUR A. SMITH (Coleraine) . . .	" *Deerfield Valley*.
AVERY P. SLADE (Somerset)	" *Bristol*.
JOHN LANE (East Bridgewater) . . .	" *Plymouth*.

Messrs. Perkins, Slade, and Taft were appointed a committee upon the assignment of delegates to the meetings of the societies.

Messrs. Grinnell, Nichols, and Moore were appointed a committee to report a list of subjects for investigation, and to assign committees upon them.

Messrs. Moore, Ware, Pierson, and Lane were appointed a committee upon time and place of holding the country meeting.

Messrs. Gleason, Mayhew, and Goodrich were appointed a committee to consider any proposed changes in times of holding fairs.

Col. WILDER then took the chair.

Mr. WARE, delegate to the annual meeting of the Hampshire, Franklin, and Hampden Society, read his report, setting forth a violation of the rules of the Board by the officers of that society. This report led to much discussion of the rules, in which many members of the Board participated. In the absence of Mr. Demond, delegate from the Hampshire, Franklin, and Hampden Society, Mr. Haskell, the president, was heard in defence.

On motion of Mr. Grinnell it was

Voted, That although there was a technical violation of the rules of the Board by the Hampshire, Franklin, and Hampden Agricultural Society, in the removal of cattle from the fair-grounds before three o'clock on the 6th of October, being the first day of the fair, yet, under the peculiar circumstances of the cases, the Board does not object to the payment of the suspended premiums; but this is to be taken as a notice to this society, and all others, that this rule must hereafter be enforced.

The Board then proceeded to the election of a secretary by ballot. Mr. John E. Russell was elected.

Mr. GRINNELL being called to the chair, reports were received upon the institutes held by the societies during the year past.

From the evidence presented, it appeared that all the societies had complied with the rule of the Board, several of them having held more institutes than they were required to hold, with great interest on the part of the farmers, and with much benefit to the agricultural community.

Mr. Ware presented the following essay upon

EXPERIMENTS IN POTATO-CULTURE.

Although the potato has been known as an article of food for over two hundred years, it has come into general use only within the memory of people who are still living. It has now, however, become the most important vegetable grown on the farm. The culinary practices of most of the civilized nations of the earth involve the use of the potato to such an extent, that it is a necessity for all classes, — for the rich and for the poor alike. A very short crop of potatoes in Ireland produces a famine there. Ordinarily it may be found as an indispensable article of food upon the tables of the poorest families; and the most sumptuous feast would be incomplete without it.

The potato will grow in all latitudes from Florida to Norway, under almost all circumstances and conditions; and yet there is probably no crop that is grown with so much uncertainty, upon the cultivation of which there is so little exact knowledge, and concerning which there is such a diversity of opinion among cultivators. For instance, such points as the following are entirely unsettled: 1. Whether it is better to plant whole large potatoes, whole small ones, or pieces of large ones; if pieces are used, what is the best size and number of eyes? 2. Which end of the tuber is best for planting? 3. Whether it is better to use potatoes that are fully ripe, or those not quite ripe, for planting? 4. If the potato is cut, is it better to plant the cut pieces at once, or to let them lay in the air a few days, until the cut surfaces have seared over so that they will not bleed? 5. Whether it is better to continue planting potatoes raised on the same farm year after year, or to get potatoes for seed from different localities; if the latter, how often should the seed be changed? 6. If the seed is changed, should it be obtained from the North, or from the South? 7. Is it better to plant in hills or drills? 8. How much seed should be put in a hill, or how far apart should the seed be dropped in the drills? and what distance should be between the rows? 9. Shall the seed be covered two, four, or eight inches deep? 10. Is it better to plough the land for potatoes in the fall as well as in the spring, or only in the spring? 11. How deep

shall the land be ploughed? 12. Shall the manure applied be ploughed in, or spread on after ploughing, and harrowed in, or left on the surface? 13. Is it better to put the manure in the hill or drill than to spread it on the land? if so, is it better to put the seed under or over the manure? 14. Is early or late planting most likely to secure the largest crops? 15. Is it best to use coarse green manure, or fine and well-fermented manure, or guano, or chemical fertilizer, or a part of two or more of these, or no fertilizer at all? 16. Is newly broken or old land best for potatoes?

After the cultivator has settled these points to his satisfaction, it may be well for him to consider how he will cultivate his crop: 1. Whether he will cultivate entirely with horse implements, or with hand-hoes and potato-diggers, or what proportion of each. 2. Is level culture, or hilling-up, the better way? 3. Is it better to protect the crop from the Colorado potato-bug by hand-picking, by brushing them into a pan, by using Paris-green mixed dry with plaster or in water, and in what proportion? or is the less expensive London-purple equally effective? 4. Is the potato-rot caused by an insect, or fungus, or climatic influences? and how is the crop best protected from its effects?

These are some of the many questions regarding the cultivation of the potato, that, notwithstanding experiments covering these points that have been tried during the past half-century with more or less exactness, and in a way that satisfied the minds of the individual experimenters, are as yet unsettled among the best cultivators. On either one of these points there may be found advocates for the adoption of each way as the better method, as demonstrated by actual experiments of their own.

The following are a few samples of these experiments that have been tried: Mr. Caleb Childs of Marblehead — once with the Jackson White, and once with the Early Rose — tried planting seed from a distance, under the same conditions, and side by side with seed of his own raising. In both cases the new seed yielded double the crop of the home-raised seed. Another farmer in Worcester County has raised the Early Rose potatoes, without changing seed, since they were first introduced, and he thinks they have continued to improve in quality and production up to this time. He has

been careful to select the best specimens of his potatoes for seed, and thinks this is the cause of the improvement. There are very many writers and scientists who advocate the theory of planting whole potatoes, for the reason that the young sprout, before it has acquired the ability to nourish itself by its roots, depends for its nourishment on the fecula, or starch, of the tuber, which would be more abundantly supplied from the whole tuber than from a piece of it, and consequently would produce more vigorous plants. On the other hand, Mr. M. I. Wheeler of Great Barrington declares that the best crop that he ever raised came from sprouts taken off from the potato. A very singular result came from an accidental experiment made by Mr. David Warren of Marblehead. He cut his seed-potatoes, took them into the field, and planted a part of them. He was prevented from planting any more until the third day after this, when he planted another portion of the field. He did not finish planting the field until the second day after the second planting. The unplanted seed remained in the field all this time. He found on digging that the first planting yielded a quarter more than the second planting, and that the third planting yielded a quarter more than the first, — a result that he could in no way account for, as the whole field had the same treatment. Aaron Low of Essex planted five rows with whole small potatoes, and another five rows with large potatoes cut to two eyes, all other conditions being the same. The whole small potatoes yielded fourteen per cent more than the cut large ones.

Most cultivators would favor careful ploughing and fine tilth; yet excellent crops have been grown by dropping the seed upon hard ground, and mulching sufficiently with straw or other coarse material to keep it moist.

Although it is the usual practice, and is considered the best method, to hill up potatoes, Mr. Edmund Hersey of Hingham, after careful experiment, has fully satisfied himself that level culture gives much better results.

Mr. Allen Rowe of Swampscott has found by experiment that fall ploughing on his land adds very much to his potato-crop. His land is generally rather heavy with a clay subsoil; and probably on such soil fall ploughing is more essential than on lighter soils. Mr. Rowe also finds that

the Cumberland superphosphate manufactured in Maine, used in connection with other manure, adds very much to his success in raising potatoes.

The farmers of Danvers and Peabody have been very successful in raising the best quality of potatoes for several successive years on the same land by using only Peruvian guano for manure. This is in conflict with the generally accepted idea that it is necessary to change potatoes from the same to newly broken land in order to obtain the best results. On the other hand, very many experiments might be quoted to show that very coarse manure mixed with bedding has appeared to be the best for potatoes. Mr. Aaron Low of Essex has been successful by leaving a vacant hill once in eight feet in every third row in his early potato-field, and planting in this hill, about the 25th of June, Essex hybrid squash-seed. As the potato-tops die down, the squash-vines cover the ground. In this way he has raised a good crop of potatoes and over ten tons of squashes per acre on the same land. This method can only be successful by the liberal application of manure.

It is unnecessary to cite any more cases to show that there is but little certain knowledge concerning the best methods for cultivating potatoes, notwithstanding the fact that nearly every person, be he farmer or not, would feel insulted if his ability to raise potatoes in the best manner were doubted. This uncertainty of results is equally true of most of the other farm-crops.

This conflict of opinions concerning this common product of the farm proves the necessity for the establishment of a thoroughly equipped experiment station, at which careful scientific observation and investigation can be made in a manner that is impossible for the farmer under ordinary conditions.

In this connection it may be well to state some points in potato-culture that are generally accepted by experienced cultivators as good methods for practice, that can be safely followed. Fall ploughing eight inches deep is especially recommended for heavy land with hardpan or clayey subsoil. In the spring the land should be harrowed, and then ploughed six inches deep, as early as it is sufficiently dry to be friable. Then, if the manure is not too coarse, it should

be spread on, and harrowed in. If the manure is very coarse, it should either be spread on before the spring ploughing, or put in the furrow. After harrowing, the land should be furrowed out, the furrows three feet and a half apart and four inches deep. Then drop the seed-potatoes, cut into pieces with two eyes each, ten or twelve inches apart in the furrow. If guano or commercial fertilizer is used, strew it in the furrow. Then cover with a plough by turning the furrow back. Harrow the whole surface, regardless of the rows, a week before the potatoes come up, and drag with a smoothing-drag just before they break ground. A Thomas smoothing-harrow may be used once or twice after the plants are up, without injuring them. This will kill all the small weeds that have come up. After this a cultivator should be run between the rows, and very near them, two or three times before the plants are in blossom. After this there should be no further cultivation, and there is no need of it if the weeds have been properly kept down up to this time. If hilling is desired, a hilling horse-hoe can be used the last two times. By using this method, hand-hoeing is unnecessary, and much labor is saved. The labor of digging is much reduced, unless a horse potato-digger, of which there are several good patterns, is used, by running a small plough each side of the row, and turning the furrow outwards. If grass-land is used for potatoes, labor may be saved by turning the sod five inches deep, and dropping the seed under the edge of every third furrow, so that the horse or ox that walks in the furrow will not tread upon it. If commercial fertilizer is used in this case, it can be strewn between the furrows, over the seed. This method has in some cases been very successful. One way of protecting the potato-vines from potato-bugs is to train a flock of light Brahma fowls to eat them. The fowls can easily be trained to work down the rows by scattering a little corn in them. Twenty fowls will usually protect an acre of potatoes. Paris-green is probably most generally used as an antidote to the bugs. It may be either dusted over the vines, mixed with fine-ground plaster, at the rate of one pound of Paris-green and seventy-five pounds of plaster to the acre, or sprinkled over the vines mixed in water, through a fine rose watering-pot, at the rate of half a teaspoonful of

Paris-green to a bucket of water. London-purple is cheaper than Paris-green, and may be used in the same way. It is effectual, but acts less quickly than Paris-green. The potato-rot was very destructive a few years ago, but has been less so of late years. It usually first attacks the vines after a warm rain, or foggy weather, when the crop is in its most vigorous growth. It is probably caused by fungus, the spores of which take root when the above-mentioned favorable conditions occur, and the disease rapidly spreads over the field. The crop may generally be saved by mowing off the vines close to the ground before the tubers are affected. In this case the potatoes should not be dug until after all signs of the disease have disappeared.

The following are some maxims that may be generally accepted as true concerning potatoes: —

The natural life of a variety is from fourteen to twenty years: hence the importance and necessity of getting new seedling varieties from the most vigorous, prolific, and best varieties known.

A dry season does not have the effect of producing a dry quality of potatoes, but usually the reverse.

A large dressing of strong green manure may produce a large crop of potatoes; but the quality will be inferior, and there will be a rank growth of vines that is quite susceptible to disease.

Concentrated fertilizers, such as guano and chemical phosphates, produce potatoes of good quality.

Virgin soil with little or no manure will produce the best quality of potatoes.

Seed-potatoes will not produce healthy vines if exposed to the cold, even if the cold were not sufficient to affect their outward appearance.

The quality of potatoes is seriously affected by exposure to strong light for some length of time.

This essay was discussed with much interest, after which Mr. Hersey read the following essay upon

THE CULTIVATION OF THE BASKET-WILLOW.

The preparation of this paper has been delayed, that all doubts might be removed in regard to the name of the

variety of willow which has been found to be best adapted to our climate, and to furnish the best osiers for basket-work. The name of this variety was supposed to be *Salix viminalis*. It was brought into the State about twenty-seven years ago under that name, and, being widely disseminated as such, no suspicion was entertained that it was any other variety. As it proved far superior to all other varieties when grown on warm land, there seemed no occasion for doubt or dissatisfaction, and so no investigation was made; but, when it was decided to prepare a paper on the subject, it was thought best to make a critical examination, that the paper might be as free from errors as possible. When it was too late to examine the blossom, the leaves were examined, and found not to conform to the drawings of the *viminalis*, being much wider at the end; the *viminalis* having a long leaf terminating with a sharper point. To remove all doubts, it was thought best to defer the preparation of this paper another year, that the blossoms might be examined. Last spring both the blossoms and leaves were compared with the drawings, when it was found to compare precisely with the variety under the name of *Salix purpurea*. To settle the point, later in the season specimens of flowers and leaves were sent to Professor Maynard of the Agricultural College at Amherst, who pronounced them to be the flowers and leaves of the *Salix purpurea*.

The details are thus given, because it is believed to be important that all who attempt to grow willows should be sure of the variety. As the true *viminalis* is not as well adapted to our hot sun, and to high, dry land, as the *purpurea*, it is important that they should no longer be confounded with each other.

The osiers of the *purpurea* are very long and slim, and are considered by the basket-manufacturers to be superior to all others. On high, warm land this variety will make a growth of from five to nine feet in length in a single season. The soil which is best adapted to its growth is that which will produce a good crop of Indian-corn. In setting a plantation, the soil should receive a similar preparation as for a crop of corn. The willow-cuttings should be twelve inches long, and not less than one-fourth of an inch in diameter; should be set in rows two feet apart each way. If the land be prop-

erly prepared, the cuttings can be pressed in with the hand. They should not be set perpendicular, but on an angle of about forty-five degrees, leaving two or three inches of the end above the surface. The first and second year the land should be kept well cultivated; after that the crop will require but little attention by way of cultivation, nor will the land require any manure after the first year. The second year, some time during the winter, the willows should be cut very near the ground. This first crop will be of little value except for cuttings for new plantations. The third year a good crop of osiers will be obtained. If for basket-work, they should be cut early in March, tied in bundles of about fifty pounds each, with the large ends all in one direction and as even as possible. The bundles should be set in water three or four inches deep, and kept there until the bark will readily slip: the osiers should then be peeled, and rebundled for market. If it is desired to grow for hoop-poles, the willows should be cut but once in three years. To prevent side-shoots, in the spring of the second year, when the leaves are about one-half an inch in length, they should be rubbed off by passing the thumb and finger down the twig, leaving only a small tuft of leaves on the top: this, at the right season, can be done very rapidly. At the end of three years they will make excellent hoop-poles, — very straight, free from knots, and almost as large at the top end as at the bottom. An acre of warm land, after the first five years, will produce every three years one hundred thousand hoop-poles, the value of which will depend on location. An acre of warm land that will produce forty bushels of Indian-corn will, after the first three years, produce yearly from one to two tons of peeled osiers. The only expense attending this crop is cutting and peeling the osiers; the land requiring no manuring after the willows are set, and no cultivation after the first three years. The expense of cutting is very trifling; but the peeling, if done by hand, will cost about three cents a pound. When the willows are grown to any extent, machines of a trifling cost will undoubtedly be invented, that will reduce the cost to one-half a cent a pound: already machines are in use which very much reduce the labor. The price which willows for basket-work have sold for at wholesale during the past five years has been from six to eight

cents per pound, according to quality. An acre of land will produce an average yearly crop of three thousand pounds, worth two hundred and ten dollars. If peeled by hand, it will cost ninety dollars. The cutting and all other expenses will not exceed twenty dollars; leaving ninety dollars profit. If machines are introduced, reducing the cost of peeling to half a cent a pound, the profit will be increased to a hundred and sixty-five dollars per acre. If one-half of this can be realized, our light land can be put to no more profitable use. The above statement of the amount which will grow on an acre is not guesswork, but from actual tests: in fact, under favorable conditions, a few rods have been grown that produced, the second year after set, at the rate of six thousand pounds of peeled osiers to the acre.

Years of experience and close observation have removed all doubts that the willow can not only be easily grown on light, dry land, but also grown at a large profit, providing the present and past prices can be maintained. As this must depend in a great measure on the extent of the basket business and the amount of importations of willows and willow-ware, a careful investigation has been made to ascertain to what extent importations have been made during the last twenty years. The "New American Cyclopædia," published by D. Appleton & Co. in the year 1870 (vol. 2, p. 706), states that "the value of the osier, in both the crude and the manufactured state, annually imported into this country, is about five million dollars." This same statement is found in various papers written by men whose authority has ever been unquestioned. If these figures are correct, it is evident that it will be some years before the market will be overstocked; for, our willows for many kinds of work being superior to the imported, an increased production would reduce and finally stop importations. To make this paper as reliable as possible, it was thought best to get the official figures in regard to importations. Application for this purpose was made to Mr. Beard, collector for the port of Boston, who very kindly furnished the amount of importations into the United States for each year since 1870; his record not extending back any farther. Application was made to the Bureau of Statistics at Washington, which was very promptly answered, giving the amount of importations

for each year since 1857, that being as far back as any separate record had been made of the article of willows. Only a portion of the returns are given, as follows: —

The importations of unmanufactured willow into this country for the year ending June 30, 1858, was $55,141, manufactured willow-ware, $112,725; for the year 1865, unmanufactured willows, $28,028, manufactured, $88,843; 1870, unmanufactured, $50,715, manufactured, $294,409; 1875, unmanufactured, $34,440, manufactured, $162,785; 1878, unmanufactured, $15,966, manufactured, $91,445. In 1879 (the last returns that could be obtained) the amount of unmanufactured willow imported was $9,142. The largest amount imported in any one year was the year ending June 30, 1866, when the amount of unmanufactured willow was $57,907, manufactured, $229,104; a total amount for the year, of $287,011.

By the official figures it would seem, that, if the entire importation of willows should cease, it would create an additional demand for only $9,142 worth: if this be correct, it is evident that an increase of production would overstock the market, and greatly reduce prices.

The demand for hoop-poles is large, and in some sections large quantities of binders for square boxes are required. For the latter purpose the willow is admirably adapted, being very tough, and free from knots. There are undoubtedly many localities in the State where the willow could be grown at a very large profit for this purpose.

These papers were ordered to be printed in the Annual Report.

The secretary presented a proof-copy of the statutes governing the agricultural societies, as revised by the commission; and a committee was appointed to examine them, consisting of Messrs. Hersey, Taft, Wheeler, and Grinnell.

The Board then adjourned to ten o'clock A.M., Thursday.

THIRD DAY.

The Board met at ten o'clock A.M., Mr. GRINNELL in the chair.

Present: Messrs. Anderson, Bird, Baker, Goessmann, Gleason, Gaylord, Goodrich, Hadwen, Hersey, Herrick, Lane, Lynde, Mayhew, Moore, Nichols, Pierson, Sessions, Slade, Smith, Taft, Varnum, Wakefield, Ware, Wheeler, and Wilder.

Mr. PERKINS, from the Committee upon the Assignment of Delegates, reported as follows: —

APPOINTMENT OF DELEGATES.

Essex, at Haverhill, Sept. 27, 28 . . .	E. H. GOODRICH, Jun.
Middlesex, at Concord, Sept. 28, 29, 30 . .	A. C. VARNUM.
Middlesex North, at Lowell, Sept. 27, 28 . .	G. M. BAKER.
Middlesex South, at Framingham, Sept. 20, 21,	H. M. PIERSON.
Worcester, at Worcester, Sept. 6, 7, 8, 9 . .	J. P. LYNDE.
Worcester West, at Barre, Sept. 29, 30 . .	ARTHUR A. SMITH.
Worcester North, at Fitchburg, Sept. 27, 28 .	E. C. FARNSWORTH.
Worcester North-west, at Athol, Oct. 4, 5 . .	J. R. NICHOLS.
Worcester South, at Sturbridge, Sept. 15, 16 .	W. R. SESSIONS.
Worcester S.-E., at Milford, Sept. 27, 28, 29,	S. B. BIRD.
Hampshire, *Franklin*, and *Hampden*, at Northampton, Oct. 5, 6, 7	EDMUND HERSEY.
Hampshire, at Amherst, Sept. 22, 23 . .	M. I. WHEELER.
Highland, at Middlefield, Sept. 15, 16 . .	J. S. ANDERSON.
Hampden, at Holyoke, Sept. 27, 28, 29 . .	JOHN LANE.
Hampden East, at Palmer, Sept. 20, 21 . .	BENJAMIN P. WARE.
Union, at Blandford, Sept. 21, 22, 23 . .	F. GAYLORD.
Franklin, at Greenfield, Sept. 29, 30 . .	H. K. HERRICK.
Deerfield Valley, at Charlemont, Sept. 22, 23 .	D. MAYHEW.
Berkshire, at Pittsfield, Oct. 4, 5, 6 . . .	A. P. SLADE.
Hoosac Valley, at North Adams, Sept. 20, 21 .	O. B. HADWEN.
Housatonic, at Gt. Barrington, Sept. 28, 29, 30,	S. N. GLEASON.
Bristol, at Taunton, Sept. 27, 28, 29 . .	GEORGE JEWETT.
Plymouth, at Bridgewater, Sept. 21, 22, 23 .	V. TAFT.
Hingham, at Hingham, Sept. 13, 14 . .	A. T. PERKINS.
Marshfield, at Marshfield, Sept. 14, 15, 16 .	H. P. WAKEFIELD.
Barnstable, at Barnstable, Sept. 27, 28 . .	E. F. BOWDITCH.
Nantucket, at Nantucket, Sept. 7, 8 . . .	J. S. GRINNELL.
Martha's Vineyard, at W. Tisbury, Oct. 4, 5 .	J. B. MOORE.

Mr. HERSEY, from the Committee to examine the Proof-Copy of the Proposed Revision of the Statutes, reported

that the alterations were verbal only, and that the form and language adopted by the Commissioners upon Revision was satisfactory.

Mr. MOORE, from the Committee upon Time and Place of holding the Country Meeting, reported that it should be held at Bridgewater, Plymouth County, beginning on the first Tuesday in December.

Committee on Meeting: Messrs. Lane, Slade, Perkins, Hersey, Moore, and the secretary.

Mr. GLEASON, from Committee on Proposed Changes of Time of holding Fairs, reported that the Worcester Society should hold their fair beginning on the sixth day of September, and the Worcester South on the fifteenth.

The foregoing reports were adopted.

Voted, That the secretary petition the Legislature for the establishment of an experimental station at the Agricultural College.

Voted, That the secretary appear on behalf of the Board before committee of the Legislature as occasion may require.

Messrs. Jewett and Slade were appointed upon the Examining Committee of the Agricultural College; making the committee stand in the following order, — Messrs. Bowditch, Wheeler, Lynde, Jewett, and Slade.

Messrs. Wilder, Bowditch, Moore, Slade, and Lane were appointed an Executive Committee.

Messrs. Hersey, Moore, and Bowditch were appointed a Committee on Printing.

Messrs. Hersey, Wakefield, and Smith were appointed a Committee upon the Revision of the Rules of the Board governing the Action of the Agricultural Societies.

Professor GOESSMANN presented his Annual Report upon the Examination of Commercial Fertilizers, which was read, adopted, and ordered to be printed in the Annual Report.

EIGHTH ANNUAL REPORT ON COMMERCIAL FERTILIZERS.

To the Massachusetts State Board of Agriculture.

GENTLEMEN, — The trade in commercial fertilizers has been quite active during the past year. The demand for reputed standard articles has not unfrequently exceeded the resources of the manufacturer. The general improvement in the preparation of the commercial fertilizers, in consequence of a careful supervision of this branch of industry, as well as a growing intelligent appreciation of their true relation to a rational system of manuring our farm-lands, cannot but cause a steady increase in our home consumption. The number of brands offered for sale within the limits of our State has not materially changed. Some dealers have withdrawn their goods, and others have taken their places: on the whole, our agricultural home interests have been the gainer by these changes. Dealers in articles of doubtful merits have to resort to a change in the name of their articles to secure patrons; whilst real spurious articles can only be sold by irresponsible travelling agents: their operations are usually confined to a limited locality, and are of a sporadic character. With the assistance of the farmers, these practices may be entirely eradicated. The majority of our farmers, benefiting by the advice coming from their State Board, quite properly prefer to patronize those manufacturers, without reference to locality, who court a fair investigation of their articles by recording their general character, as prescribed by our State laws, at the office of the secretaries of the Commonwealth and of the State Board of Agriculture, and who offer their goods for sale through responsible parties.

To meet the just claims of those of our manufacturers whose business transactions extend beyond our State lines, for a harmonious action of State inspectors of fertilizers, and others connected with the examination of commercial fertilizers, I attended during the past year (July 28, 1880), at the invitation of Judge J. T. Henderson, commissioner of agriculture of the State of Georgia, a convention of State commissioners of agriculture, State inspectors of fertilizers, and chemists connected with the manufacture of fertilizers and the fertilizer trade in general, at Washington, D.C., to discuss the fertilizer question, and, in particular, to devise

and to adopt a common plan for their chemical examination. This meeting took place in the library-room of the National Department of Agriculture, which had been kindly offered by Gen. Le Duc for that purpose. Some twenty delegates — representing the States of Georgia, South Carolina, North Carolina, Virginia, Maryland, Delaware, New York, New Jersey, Connecticut, Maine, and Massachusetts — attended the convention. After some discussion of the best current chemical methods of ascertaining the quantity and the quality of the essential constituents of fertilizers, as potassa, nitrogen, and phosphoric acid, it was decided to adopt provisionally, with the exception of a few additional suggestions, the modes recommended for that purpose by Fresenius, Neubauer, and Lucke, and indorsed by a convention of the chemists of the German agricultural experiment stations, as binding for all present. The transactions of the meeting have been printed by the courtesy of Commissioner J. T. Henderson of Atlanta, Ga., and have been extensively circulated. Copies may be obtained by application to him. A subsequent largely attended meeting of agricultural chemists in Boston (Aug. 27, 1880) has since indorsed the plan adopted, and measures have been taken to perpetuate an organized home effort of agricultural chemists for the promotion of scientific agriculture in general.

The fluctuations in the wholesale prices of crude stock are reported to have been more serious during the past year than in the previous one. Nitrogen and potassa compounds in particular have commanded a higher price during the second half of the past year. The retail prices of our standard fertilizers have been, however, but little affected, as the main bulk, sold in the spring of the year, had been manufactured previous to the change in the market-price of the crude stock. The following prices have been adopted as a fair valuation of the essential constituents of fertilizers during the past year: only *specified* forms of guaranteed composition of the fertilizer have been differently valued.

	Cents.
Nitrogen in form of nitric acid	24
Nitrogen in form of ammonia	24
Nitrogen in form of animal matter	20
Soluble phosphoric acid	12

	Cents.
Reverted phosphoric acid	9
Insoluble phosphoric acid	6
Potassium oxide in muriate of potash	4.5
Potassium oxide in kainit	6
Potassium oxide in high grades of sulphate of potassa	7

In case of inferior mechanical condition of the fertilizers, the customary lower rates have been adopted. Whatever effect the late rise in the price of the crude stock of the various materials used for the manufacture of fertilizers may have on the cost of our standard fertilizers during the coming year must be left to future developments.

New-York and Boston Market-Prices for the Year 1880 (*March*).

I.

	Price per pound, in cents.
I. *Nitrogen.* In form of nitric acid	24
In form of ammonia	24
In form of dried ground meat and blood, finely pulverized steamed bones, finely ground fish-guano, Peruvian guano, urates, poudrettes, and artificial guano	20
In form of finely ground bones, fine-ground horn, wool-dust, bat-guano, etc.	18
In form of coarsely ground bones, horn-shavings, and woollen rags, human excretions and barnyard manure, fish-scraps, animal-refuse matter from glue-factories and tanneries, etc.	15
II. *Phosphoric Acid soluble in water.* As contained in alkaline phosphates and superphosphates	12
In Peruvian guano and urates	9
In form of so-called reduced or reverted acid	9
In precipitated bone phosphate, steamed fine bones, fish-guano, according to size and disintegration, from	6 to 6.5
In form of bone-black waste, wood-ash, Caribbean guano, ground bone-ash, coarsely ground bones, poudrette, barnyard manure, etc.	5
In form of finely ground South-Carolina and Nevassa phosphates	3.5
III. *Potassium Oxide.* In form of muriate of potash or chloride of potassium	4.5
In form of sulphate of potassa in natural and artificial kainits	5.5 to 6
In form of higher grades of sulphate of potassa	7 to 7.5

II.

NAME OF MATERIAL.	Price per ton of 2,000 pounds, in dollars.	Price per pound, in case of from 100 to 200 pounds, in cents.
Sulphate of Ammonia, containing from 24 to 25 per cent of ammonia	90–95	4–5
Nitrate of Soda (Chili saltpetre), containing 95 per cent of that compound . .	85–90	4.5–5.5
Nitrate of Potassa, containing 94 to 96 per cent of that compound . . .	165–170	9–9.5
Dried Blood, yielding from —		
(*a*) 12 to 14 per cent of ammonia . .	50	2.5–3
(*b*) 10 to 12 per cent of ammonia . .	45	2.8
Dried Meat, yielding from 14 to 15 per cent of ammonia	50	3
Fine-ground Bones, containing from 22 to 24 per cent phosphoric acid, and yielding from 3.5 to 4.5 per cent of ammonia .	35–40	2.5
Bone-Black (waste material), containing from 30 to 34 per cent of phosphoric acid .	28–30	1.5
Superphosphate of Lime, containing from 15 to 16 per cent of soluble phosphoric acid.	32–35	2
No. 1 *Peruvian Guano* (guaranteed): —		
Cargo B, containing 11.50 per cent of ammonia, 17.10 per cent of phosphoric acid, 3.20 per cent of potash . .	70	7.4
Cargo K, containing 6.30 per cent of ammonia, 18.30 per cent of phosphoric acid, 2.50 per cent of potash . .	56	5.9
No. 2 *Peruvian Guano*, containing 3 per cent of ammonia, 15 per cent of phosphoric acid, 2 per cent of potash . . .	38	4
Muriate of Potash, containing from 80 to 85 per cent of that compound, equal to from 50 to 53.7 per cent of potassium oxide	42	3
Muriate of Potash (Douglasshall), containing 80 per cent of that compound, equal to 50 per cent of potassium oxide and about 10 per cent of sulphate of magnesia	45	2.5
Sulphate of Potassa, containing 80 per cent of that compound, which is equal to 43.3 per cent of potassium oxide . .	65	4
Sulphate of Potassa, containing from 60 to 65 per cent of that compound, which is equal to from 32.3 to 35 per cent of potassium oxide	55–60	3.5
Sulphate of Potassa, test 40 to 60 per cent of that compound, equal to 22 to 38 per cent of potassium oxide. Standard contains 50 per cent of sulphate of potassium, equal to 27.5 per cent of potassium oxide	35	2

MATERIAL.	Price per ton of 2,000 pounds, in dollars.	Price per pound, in case of from 100 to 200 pounds, in cents.
German Potash-Salt, containing from 28 to 32 per cent of sulphate of potassa, which is equal to from 15 to 17.3 per cent of potassium oxide	20–25	1.25
Kainit, low grade, containing 22 to 26 per cent of sulphate of potassa, which is equal to from 11.9 to 14 per cent of potassium oxide	15–18	1
Sulphate of Magnesia (Kieserite), containing 55 per cent of that compound . .	14–15	.8
Sulphate of Magnesia (Kieserite), containing from 60 to 70 per cent of that compound,	20–25	1.25–1.50
Fine-ground Gypsum, containing from 95 to 98 per cent of that compound . . .	9-10	.5

POTASH COMPOUNDS.

I.

Muriate of Potash.

(Messrs. Bagg & Batchelder, Springfield, Mass.)

	Per cent.
Moisture lost at 100° C.	.43
Potassium oxide	57.73
Potassium chloride	91.90
Sodium chloride	8.57
Insoluble matter	.20

II.

Muriate of Potash.

(Sent by Hon. James S. Grinnell, Greenfield, Mass.)

	Per cent.
Moisture lost at 100° C.	.53
Potassium oxide	51.99
Potassium chloride	82.30
Sodium chloride	13.80

III.

Kainit.

(Messrs. Horton & Phelps, Northampton, Mass.; $18 per ton of 2,000 pounds.)

	Per cent.
Moisture lost at 100° C.	2.80
Potassium oxide	12.51
Calcium oxide	1.01
Magnesium oxide	11.90
Sulphuric acid	23.71
Insoluble matter	.17

IV.

Sulphate of Potassa.

(From a New-York dealer; collected of Mr. F. J. Kinney, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	5.00
Potassium oxide	49.05
Sulphuric acid	45.80
Calcium oxide	Trace.
Insoluble matter	.14

Nos. I. and II. of the above compounds are fair specimens of their kind. No. III. is apparently a native kainit, containing about two-thirds of its potassium as sulphate, and the rest as chloride. No. IV. is a product of manufacture. It contains from three to four per cent of free sulphuric acid, which is less than is usually met with in this class of articles.

Wood-Ash, Oswego, N.Y.

(Mr. Chittenden, Sunderland, Mass.)

	Per cent.
Moisture lost at 100° C.	22.74
Potassium oxide	5.04
Calcium oxide	30.30
Magnesium oxide	Trace.
Phosphoric acid	2.16
Matter insoluble in acids	9.09

This is a good quality of its kind.

Mr. Henry G. Hawes, No. 2 Central Wharf, Boston, Mass., has recently sent to my office a series of samples of German potash-salts (eight in number), which he proposes to sell, with guaranty of composition, in our wholesale and retail market. Mr. Hawes states that he has been appointed the sole agent for the United States for the sale of the potash compounds manufactured under the direction of Dr. A. Frank, director of the "Vereinigte Chemische Fabriken," at Stassfurt, Germany. As I referred in my Second Annual Report on Commercial Fertilizers somewhat in detail to the potash industry at Stassfurt, and described on that occasion some of the principal potash compounds now offered for sale by Mr. Hawes (see "Twenty-second Annual Report of the Secretary of the Massachusetts State Board of Agriculture"),

I take the liberty to call the attention of all parties interested to my previous discussion on the respective merits of the various brands in our agricultural industry now offered for sale. It is to be hoped that the most important standard brands of potassium chlorides and sulphates may henceforth be had for a course of years, to permit a thorough experimental inquiry into their special fitness, in our climate, for different crops and upon different kinds of soil.

Gypsum.

I.

(Sent by Mr. T. D. Thatcher, Springfield, Mass.)

A.

	Per cent.
Moisture lost at 100° C.	8.70
Sulphuric acid	45.60
Calcium oxide	33.60
Magnesium oxide	.51
Insoluble matter	.75

B.

	Per cent.
Moisture lost at 100° C.	6.46
Sulphuric acid	33.56
Calcium oxide	30.60
Magnesium oxide	Trace.
Insoluble matter	7.95

Sample B contains from six to seven per cent of its lime in form of carbonate of lime (from 10.5 to 12 per cent).

Gypsum (Nova Scotia).

II.

(Mr. P. Holden, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	3.72
Insoluble matter	.45
Sulphuric acid	50.18
Calcium oxide	34.82

Gypsum.

III.

(Messrs. Arms & Co., Greenfield, Mass.)

	Per cent.
Moisture lost at 100° C.	.52
Insoluble matter	2.95
Sulphuric acid	44.15
Calcium oxide	33.88

This sample contains from five to six per cent of carbonate of lime.

Lime-Waste from the Portland Beet-Sugar Factory.

(Sent on by Hon. Benjamin Ware, Marblehead, Mass.)

	Per cent.
Moisture lost at 100° C.	36 30
Phosphoric acid	2.25
Potassium oxide	.22
Calcium oxide	27.51
Magnesium oxide	Traces.
Insoluble matter	.32

This waste product consists, in the main, of carbonate of lime. Its agricultural value as a lime compound is somewhat increased by the access of phosphoric acid, which may be valued from nine to ten cents per hundred-weight. Its percentage of potash is scarcely more than many varieties of limestone contain.

Dried Blood.

(Sent by a dealer in Boston, Mass.)

	Per cent.
Moisture lost at 100° C.	10.66
Nitrogen	11.35

Dried Meat.

(Sent on for examination.)

	Per cent.
Moisture lost at 100° C.	14.15
Nitrogen	10.40

Oleomargarine Refuse Fertilizer, Cambridge, Mass.

(Collected of Mr. Hawks, Amherst, Mass.)

	Per cent.
Moisture lost at 100° C.	8.54
Organic matter	85.58
Ash constituents	14.42
Nitrogen in organic matter	10.12
Phosphoric acid in ash	.88
Insoluble matter	.96

Valuation per ton of two thousand pounds: —

202.4 pounds of nitrogen (15 cents per pound).	$30 36
17.6 pounds of phosphoric acid	88
	$31 24

Castor-Bean Pomace, St. Louis.

(Collected of Messrs. Horton & Phelps, Northampton, Mass.)

	Per cent.
Moisture lost at 100° C.	9.50
Nitrogen	5.66
Phosphoric acid	2.22
Potassium oxide	1.70
Calcium oxide	.77
Magnesium oxide	.20
Insoluble matter	1.12

Valuation per ton of two thousand pounds: —

113.2 pounds of nitrogen	$16 98
44.4 pounds of phosphoric acid	2 22
34 pounds of potassium oxide	1 53
	$20 73

I.

Fish-Scrap.

(Sent on for an examination.)

	Per cent.
Moisture lost at 100° C.	47.82
Organic and volatile matter	85.19
Ash constituents	14.81
Phosphoric acid	6.00
Nitrogen	4.79

Valuation per ton of two thousand pounds: —

120 pounds of phosphoric acid	$7 20
95.8 pounds of nitrogen	19 16
	$26 36

II.

Fish-Scraps.

(Quinnipiac Fertilizer Company; collected of Messrs. Horton & Phelps, Northampton, Mass.)

	Per cent.
Moisture lost at 100° C.	48.97
Organic and volatile matter	86.85
Ash constituents	13.15
Phosphoric acid	5.04
Nitrogen	4.93
Insoluble matter	2.54

Valuation per ton of two thousand pounds: —

100.8 pounds of phosphoric acid	$6 05
98.6 pounds of nitrogen	19 72
	$25 77

III.

Ground Fish.

(H. Preston & Son, Green Point, L.I.; collected of Messrs. Spaulding & Co., Northampton, Mass.)

	Per cent.
Moisture lost at 100° C.	20.58
Organic and volatile matter	63.50
Ash constituents	36.50
Phosphoric acid	7.79
Nitrogen	4.34
Insoluble matter	2.89

Valuation per ton of two thousand pounds: —

155.8 pounds of phosphoric acid	$9 35
86.8 pounds of nitrogen	17 36
	$26 71

IV.

Dried Fish.

(Quinnipiac Fertilizer Company; collected of Messrs. Bagg & Batchelder, Springfield, Mass.)

	Per cent.
Moisture lost at 100° C.	15.36
Organic and volatile matter	80.64
Ash constituents	19.36
Phosphoric acid	7.64
Nitrogen	8.76
Sand, etc.	1.58

Valuation per ton of two thousand pounds: —

152.8 pounds of phosphoric acid	$9 17
175.2 pounds of nitrogen	35 04
	$44 21

Bradley's Fish and Kainit.

(Collected of Messrs. Horton & Phelps, Northampton, Mass.)

	Per cent.
Moisture lost at 100° C.	29.05
Organic and volatile matter	72.94
Ash constituents	27.06
Phosphoric acid	5.65
Nitrogen	4.85
Potassium oxide	2.00
Insoluble matter	.64

Valuation per ton of two thousand pounds: —

97 pounds of nitrogen	$19 40
113 pounds of phosphoric acid	6 78
40 pounds of potassium oxide	2 40
	$28 58

Guaranteed Peruvian Guano.

(Messrs. Rice Brothers, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	16.25
Organic and volatile matter	53.40
Ash constituents	46.60
Total phosphoric acid	17.11
Soluble phosphoric acid	6.11
Reverted phosphoric acid	3.39
Insoluble phosphoric acid	7.61
Potassium oxide	2.60
Nitrogen	7.77
Insoluble matter	4.76

Valuation per ton of two thousand pounds: —

122.2 pounds of soluble phosphoric acid	$14 66
152.2 pounds of insoluble phosphoric acid	9 13
67.8 pounds of reverted phosphoric acid	6 11
52 pounds of potassium oxide	2 34
155.4 pounds of nitrogen	31 08
	$63 32

Mineral Phosphates.

I.

Curaçoa Guano.

(Sent on for examination.)

	Per cent.
Moisture lost at 100° C.	5.00
Organic and volatile matter	33.87
Ash constituents	66.13
Total phosphoric acid	23.23
Insoluble phosphoric acid	19.88
Reverted phosphoric acid	3.35
Calcium oxide	33.75

Valuation per ton of two thousand pounds: —

397.6 pounds of insoluble phosphoric acid	$19 88
67 pounds of reverted phosphoric acid	6 03
	$25 91

This guano is deficient in organic matter, and consists of from fifty to fifty-one per cent of phosphate of lime, in a fine mechanical condition, and from twelve to fourteen per cent of carbonate of lime.

II.

Soluble South-Carolina Phosphate.

(Benjamin Randall, Boston, Mass.; Thomas Aubin, agent, Boston, Mass.)

	Per cent.
Moisture lost at 100° C.	5.16
Total phosphoric acid	19.32
Soluble phosphoric acid	7.38
Insoluble phosphoric acid	11.94
Insoluble matter, sand, etc.	8.31

Valuation per ton of two thousand pounds: —

147.6 pounds of soluble phosphoric acid	$17 72
238.8 pounds of insoluble phosphoric acid	8 36
	$26 08

Bone Fertilizers.

I.

Ground Bones.

(Hargrave's Manufacturing Company, Fall River, Mass.)

	Per cent.
Moisture lost at 100° C.	8.52
Organic and volatile matter	46.64
Ash constituents	53.96
Total phosphoric acid	21 32
Total nitrogen	2.34
Insoluble matter	1.16

II.

Fine Bones.

(W. H. Bowker & Company, Boston Mass.; collected of Mr. Wescott, Amherst, Mass.)

	Per cent.
Moisture lost at 100° C.	9.72
Organic and volatile matter	36.85
Ash constituents	63.15
Total phosphoric acid	26.51
Total nitrogen	4.09
Insoluble matter, sand, etc.	.60

III.

Ground Bones.

(Messrs. Belknap & Son, Portland, Me.; collected of Messrs. Rice Brothers, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	10.51
Organic and volatile matter	44.81
Ash constituents	55.17
Total phosphoric acid	22.90
Total nitrogen	3.92
Insoluble matter	.20

IV.

Flour of Bones.

(Messrs. Rafferty & Williams, New-York City; collected of Messrs. Houghton, Garland, & Sears, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	4.10
Organic and volatile matter	42.84
Ash constituents	57.16
Total phosphoric acid	23.52
Total nitrogen	3.16
Insoluble matter, sand, etc.	1.50

V.

Flour of Bones.

(B. Randall, Boston, Mass.)

	Per cent.
Moisture lost at 100° C.	6.33
Organic and volatile matter	44.33
Ash constituents	55.67
Total phosphoric acid	22.71
Total nitrogen	4.36
Insoluble matter, sand, etc.	1.60

VI.

Ground Bones.

(Messrs. B. Arnold & Co., Boston, Mass.)

	Per cent.
Moisture lost at 100° C.	2.95
Organic and volatile matter	30.45
Ash constituents	69.55
Total phosphoric acid	26.30
Total nitrogen	2.13
Insoluble matter, sand, etc.	.58

VII.

Ground Bones.

(Holyoke Tool Factory; collected of Messrs. Bagg & Batchelder, Springfield, Mass.)

	Per cent.
Moisture lost at 100° C.	7.73
Organic and volatile matter	35.22
Ash constituents	64.78
Total phosphoric acid	24.76
Total nitrogen	3.65
Insoluble matter, sand, etc.	2.60

VIII.

Bone Sawings.

(Holyoke, Mass.; collected of Messrs. Horton & Phelps, Northampton, Mass.)

	Per cent.
Moisture lost at 100° C.	5.00
Organic and volatile matter	37.77
Ash constituents	62.23
Total phosphoric acid	25.44
Total nitrogen	4.14
Insoluble matter, sand, etc.	.10

Analyses of Waste Products from a Bone and Meat Rendering Establishment.

A.—Dried Flesh and Bone.

	Per cent.
Moisture lost at 100° C.	9.12
Organic and volatile matter	80.60
Ash constituents	19.40
Total phosphoric acid	8.00
Nitrogen	7.30
Insoluble matter	1.60

B.—Dried Meat-Mass from Rendered Cattle-Feet.

	Per cent.
Moisture lost at 100° C.	18.75
Organic and volatile matter	97.10
Ash constituents	2.90
Total phosphoric acid	.56
Nitrogen	9.69
Insoluble matter	.40

C.—Soup from Meat and Bones.

One hundred pounds left 7.5 pounds of solid matter. One hundred parts of solid matter showed—

	Per cent.
Moisture lost at 100° C.	14.80
Volatile matter	91.60
Ash constituents	8.40
Total phosphoric acid	.53
Nitrogen	9.97
Insoluble matter, sand, etc.	.64

D. — Soup from Cattle-Feet.

One hundred pounds left 5.5 pounds of solid matter. One hundred parts of solid matter showed —

	Per cent.
Moisture lost at 100° C.	10.80
Volatile matter	92.50
Ash constituents	7.50
Total phosphoric acid	.46
Nitrogen	14.47
Insoluble matter, sand, etc.	.26

E. — Liquid from Lime-Vats for treating Hides.

One hundred parts left 4.5 pounds of solid residue. One hundred of that solid residue showed —

	Per cent.
Moisture lost at 100° C.	11.50
Volatile matter	59.00
Ash constituents	41.00
Total phosphoric acid	.77
Nitrogen	6.87
Calcium oxide	23.40
Insoluble matter, sand, etc.	.10

F. — Mass from Bottom of Lime-Vat.

One hundred pounds left 5.4 pounds of solid matter. One hundred parts of that solid matter showed —

	Per cent.
Moisture lost at 100° C.	17.54
Volatile matter	34.76
Ash constituents	65.24
Total phosphoric acid	.81
Calcium oxide	47.80
Nitrogen	1.06
Insoluble matter, sand, etc.	5.50

Animal Fertilizer.

(Messrs. L. B. Darling & Co.; collected of Mr. A. W. Cheever, Sheldonville, Mass.)

	Per cent.
Moisture lost at 100° C.	11.40
Total phosphoric acid	13.43
Soluble phosphoric acid	.80

	Per cent.
Reverted phosphoric acid	5.91
Insoluble phosphoric acid	6.72
Total nitrogen	5.25
Potassium oxide	5.26
Insoluble matter	1.30

Valuation per ton of two thousand pounds: —

16 pounds of soluble phosphoric acid	$1 92
118.2 pounds of reverted phosphoric acid	10 64
134.4 pounds of insoluble phosphoric acid	8 07
105 pounds of nitrogen	21 00
105.2 pounds of potassium oxide	4 74
	$46 37

Animal Fertilizer.

(Messrs. L. B. Darling & Co.; collected of Messrs. Parker & Gannet, Boston, Mass.)

	Per cent.
Moisture lost at 100° C.	10.60
Organic and volatile matter	55.73
Ash constituents	42.27
Total phosphoric acid	11.14
Soluble phosphoric acid	1.24
Reverted phosphoric acid	2.26
Insoluble phosphoric acid	7.64
Total nitrogen	5.07
Potassium oxide	5.79
Insoluble matter	2.27

Valuation per ton of two thousand pounds: —

24.8 pounds of soluble phosphoric acid	$2 98
45.2 pounds of reverted phosphoric acid	4 07
152.8 pounds of insoluble phosphoric acid	9 17
101.4 pounds of nitrogen	20 28
115.8 pounds of potassium oxide	5 21
	$41 71

Ammoniated Superphosphates.

I.

J. M. Davis's Bone Phosphate.

(E. Waldron, New Bedford, Mass.)

	Per cent.
Moisture lost at 100° C.	18.93
Organic and volatile matter	49.44
Ash constituents	50.56
Total phosphoric acid	8.77

	Per cent.
Soluble phosphoric acid	.07
Total nitrogen	2.10
Potassium oxide	5.82
Insoluble matter	4.82

Valuation per ton of two thousand pounds:—

175.4 pounds of phosphoric acid	$10 53
1.4 pounds of soluble phosphoric acid	17
42 pounds of nitrogen	8 40
116.4 pounds of potassium oxide	5 24
	$24 34

II.

Strawberry Fertilizer.

(Sent on by A. P. Slade, Esq., Somerset, Mass.)

	Per cent.
Moisture lost at 100° C.	16.66
Organic and volatile matter	65.10
Ash constituents	34.90
Total phosphoric acid	6.66
Soluble phosphoric acid	5.80
Reverted phosphoric acid	None.
Insoluble phosphoric acid	.86
Total nitrogen	3.51
Potassium oxide	4.91
Insoluble matter	.63

Valuation per ton of two thousand pounds:—

116 pounds of soluble phosphoric acid	$13 92
17.2 pounds of insoluble phosphoric acid	1 04
98.2 pounds of potassium oxide	3 93
70 2 pounds of nitrogen	14 04
	$32 93

III.

Bowker's Kitchen-Garden Fertilizer.

(Collected of Mr. Wescott, Amherst, Mass.)

	Per cent.
Moisture lost at 100° C.	14.42
Total phopshoric acid	6.42
Soluble phosphoric acid	5.02
Reverted phosphoric acid	None.
Insoluble phosphoric acid	1.40
Total nitrogen	3.80
Potassium oxide	8.92
Insoluble matter	2.50

Valuation per ton of two thousand pounds:—

100.4 pounds of soluble phosphoric acid	$12 55
28 pounds of insoluble phosphoric acid	1 68
76 pounds of nitrogen	15 20
178.4 pounds of potassium oxide	8 03
	$37 46

IV.

Bowker's Hill and Drill Phosphate.

(Collected of Mr. Wescott, Amherst, Mass.)

	Per cent.
Moisture lost at 100° C.	9.34
Organic and volatile matter	57.89
Ash constituents	42.11
Total phosphoric acid	13.15
Soluble phosphoric acid	8.70
Reverted phosphoric acid	1.60
Insoluble phosphoric acid	2.85
Total nitrogen	2.91
Insoluble matter	10.48

Valuation per ton of two thousand pounds:—

174 pounds of soluble phosphoric acid	$20 88
32 pounds of reverted phosphoric acid	2 88
57 pounds of insoluble phosphoric acid	3 42
58.2 pounds of nitrogen	11 64
	$38 82

V.

Bosworth Brothers' Ammoniated Bone Superphosphate.

(Collected of Messrs. J. Clark & Son, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	8.30
Organic and volatile matter	38.20
Ash constituents	61.80
Total phosphoric acid	15.00
Soluble phosphoric acid	5.27
Reverted phosphoric acid	4.11
Insoluble phosphoric acid	5.62
Total nitrogen	2.49
Insoluble matter	2.62

Valuation per ton of two thousand pounds:—

105.4 pounds of soluble phosphoric acid	$12 65
82.2 pounds of reverted phosphoric acid	7 40
112 4 pounds of insoluble phosphoric acid	6 75
49.8 pounds of nitrogen	9 96
	$36 76

VI.

Manhattan Blood-Guano.

(Collected of Messrs. Arms & Co., Greenfield, Mass.)

	Per cent.
Moisture lost at 100° C.	13.86
Organic and volatile matter	52.73
Ash constituents	47.27
Total phosphoric acid	12.90
Soluble phosphoric acid	7.23
Reverted phosphoric acid	1.88
Insoluble phosphoric acid	3.79
Total nitrogen	2.84
Potassium oxide	.57
Insoluble matter	3.92

Valuation per ton of two thousand pounds:—

144.6 pounds of soluble phosphoric acid	$17 36
37.6 pounds of reverted phosphoric acid	3 39
75.8 pounds of insoluble phosphoric acid	4 55
56.8 pounds of nitrogen	11 36
11.4 pounds of potassium oxide	51
	$37 17

VII.

E. F. Coe's Superior XXX Tobacco Fertilizer.

(Collected of Messrs. Arms & Co., Greenfield, Mass.)

	Per cent.
Moisture lost at 100° C.	13.57
Organic and volatile matter	55.92
Ash constituents	44.08
Total phosphoric acid	12.34
Soluble phosphoric acid	8.26
Reverted phosphoric acid	2.08
Insoluble phosphoric acid	2.00
Nitrogen	3.41
Potassium oxide	2.28
Insoluble matter	1.63

Valuation per ton of two thousand pounds:—

165.2 pounds of soluble phosphoric acid	$19 83
41.6 pounds of reverted phosphoric acid	3 75
40 pounds of insoluble phosphoric acid	2 40
68.2 pounds of nitrogen	13 64
45.6 pounds of potassium oxide	2 06
	$41 68

VIII.

Bradley's XL Superphosphate of Lime.

(Collected of Mr. Wescott, Amherst, Mass.)

	Per cent.
Moisture lost at 100° C.	17.32
Organic and volatile matter	43.97
Ash constituents	56.03
Total phosphoric acid	10.49
Soluble phosphoric acid	8.78
Reverted phosphoric acid	.09
Insoluble phosphoric acid	1.62
Total nitrogen	3.32
Potassium oxide	4.92
Insoluble matter, sand, etc.	2.55

Valuation per ton of two thousand pounds: —

175.6 pounds of soluble phosphoric acid	$21 07
1.8 pounds of reverted phosphoric acid	16
32.4 pounds of insoluble phosphoric acid	1 62
66.4 pounds of nitrogen	13 28
98.4 pounds of potassium oxide	4 43
	$40 56

IX.

E. Frank Coe's Ammoniated XX Superphosphate.

(Collected of Messrs. Arms & Co., Greenfield, Mass.)

	Per cent.
Moisture lost at 100° C.	–
Organic and volatile matter	57.99
Ash constituents	42.01
Total phosphoric acid	12.97
Soluble phosphoric acid	9.96
Reverted phosphoric acid	1.18
Insoluble phosphoric acid	1.83
Total nitrogen	2.82
Insoluble matter	1.82

Valuation per ton of two thousand pounds: —

199.2 pounds of soluble phosphoric acid	$23 91
23.6 pounds of reverted phosphoric acid	2 13
36.6 pounds of insoluble phosphoric acid	2 20
56.4 pounds of nitrogen	11 28
	$39 52

X.

Russel Coe's Ammoniated Superphosphate.

(Collected of Messrs. Spaulding & Co., Northampton, Mass.)

	Per cent.
Moisture lost at 100° C.	9.90
Organic and volatile matter	47.32
Ash constituents	52.60
Total phosphoric acid	14.63
Soluble phosphoric acid	7.08
Reverted phosphoric acid	2.22
Insoluble phosphoric acid	5.33
Total nitrogen	2.81
Insoluble matter	1.96

Valuation per ton of two thousand pounds:—

141.6 pounds of soluble phosphoric acid	$16 99
44.4 pounds of reverted phosphoric acid	3 99
106.6 pounds of insoluble phosphoric acid	6 40
56.2 pounds of nitrogen	11 24
	$38 62

XI.

Russel Coe's Ammoniated Superphosphate.

(Messrs. Rice Brothers, Worcester, Mass.)

	Per cent
Moisture lost at 100° C.	29.67
Organic and volatile matter	51.46
Ash constituents	48.54
Total phosphoric acid	14.34
Soluble phosphoric acid	5.59
Reverted phosphoric acid	3.27
Insoluble phosphoric acid	5.48
Nitrogen	2.30
Insoluble matter	1.80

Valuation per ton of two thousand pounds:—

111.8 pounds of soluble phosphoric acid	$13 42
65.4 pounds of reverted phosphoric acid	5 89
109.6 pounds of insoluble phosphoric acid	6 58
46 pounds of nitrogen	9 20
	$35 09

XII.

Bay-State Ammoniated Superphosphate.

(J. Tucker, Boston, Mass.; collected of Messrs. Clark & Son, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	18.20
Organic and volatile matter	60.56
Ash constituents	39.44
Total phosphoric acid	10.45
Soluble phosphoric acid	8.85
Insoluble phosphoric acid	1.60
Nitrogen	2.20

Valuation per ton of two thousand pounds: —

177 pounds of soluble phosphoric acid	$21 24
32 pounds of insoluble phosphoric acid	1 92
44 pounds of nitrogen	8 80
	$31 96

XIII.

"Americus" Ammoniated Bone Superphosphate.

(Messrs. Rafferty & Williams, New York; collected of Messrs. Houghton, Garland, & Sears, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	14.53
Organic and volatile matter	47.59
Ash constituents	52.41
Total phosphoric acid	12.47
Soluble phosphoric acid	7.32
Reverted phosphoric acid	1.61
Insoluble phosphoric acid	3.54
Nitrogen	3.50
Potassium oxide	2.43
Insoluble matter	4.66

Valuation per ton of two thousand pounds: —

146 4 pounds of soluble phosphoric acid	$17 57
32.2 pounds of reverted phosphoric acid	2 90
70.8 pounds of insoluble phosphoric acid	4 25
48.6 pounds of potassium oxide	2 19
70 pounds of nitrogen	14 00
	$40 91

XIV.

Bradley's XL Ammoniated Superphosphate.

(Messrs. Rice Brothers, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	15.77
Organic and volatile matter	52.72
Ash constituents	47.29
Total phosphoric acid	10.64
Soluble phosphoric acid	7.70
Reverted phosphoric acid	1.04
Insoluble phosphoric acid	1.90
Nitrogen	2.97
Potassium oxide	2.40
Insoluble matter	3.19

Valuation per ton of two thousand pounds: —

154	pounds of soluble phosphoric acid	$18 48
38	pounds of insoluble phosphoric acid	2 28
20.8	pounds of reverted phosphoric acid	1 88
59.4	pounds of nitrogen	11 88
48	pounds of potassium oxide	2 16
		$36 68

XV.

Guy's German Plant-Food for Flowers.

(C. W. Guy, Boston, Mass.)

	Per cent.
Moisture lost at 100° C.	3.35
Organic and volatile matter	51.73
Ash constituents	48.27
Total phosphoric acid	11.89
Soluble phosphoric acid	10.71
Reverted phosphoric acid	.12
Insoluble phosphoric acid	1.06
Nitrogen	6.99
Potassium oxide	.21
Insoluble matter	3.48

Valuation per ton of two thousand pounds: —

214.2	pounds of soluble phosphoric acid	$25 70
2.4	pounds of reverted phosphoric acid	22
21.2	pounds of insoluble phosphoric acid	1 27
139.8	pounds of nitrogen	27 96
4.2	pounds of potassium oxide	19
		$55 34

XVI.

Riverside Superphosphate.

(J. A. Whitten, Cambridge, Mass.; collected of George Upton, Boston, Mass.)

	Per cent.
Moisture lost at 100° C.	13.34
Organic and volatile matter	45.87
Ash constituents	54.13
Total phosphoric acid	18.64
Soluble phosphoric acid	1.46
Reverted phosphoric acid	5.13
Insoluble phosphoric acid	12.05
Total nitrogen	4.30
Insoluble matter	.94

Valuation per ton of two thousand pounds: —

29.4 pounds of soluble phosphoric acid	$2 53
102.6 pounds of reverted phosphoric acid	9 24
241 pounds of insoluble phosphoric acid	14 66
86 pounds of nitrogen	17 20
	$43 63

XVII.

Bradley's Sea-Fowl.

(Collected of Mr. Warner, Greenfield, Mass.)

	Per cent.
Moisture lost at 100° C.	12.77
Organic and volatile matter	49.53
Ash constituents	50.47
Total phosphoric acid	10.38
Soluble phosphoric acid	7.28
Reverted phosphoric acid	.41
Insoluble phosphoric acid	2.69
Total nitrogen	3.27
Potassium oxide	3.16
Insoluble matter	5.72

Valuation per ton of two thousand pounds: —

145.6 pounds of soluble phosphoric acid	$17 47
8.2 pounds of reverted phosphoric acid	74
53.8 pounds of insoluble phosphoric acid	3 23
65.4 pounds of nitrogen	13 08
73.2 pounds of potassium oxide	3 30
	$37 82

XVIII.

Soluble Pacific Guano.

(Messrs. Glidden & Curtis, Boston, Mass.; collected of Charles E. Wilder, Worcester, Mass.)

	Per cent.
Moisture lost at 100° C.	15.27
Organic and volatile matter	47.66
Ash constituents	52.34
Total phosphoric acid	13.12
Soluble phosphoric acid	7.23
Reverted phosphoric acid	2.70
Insoluble phosphoric acid	3.19
Nitrogen	2.97
Potassium oxide	2.60
Insoluble matter	5.98

Valuation per ton of two thousand pounds: —

144.6 pounds of soluble phosphoric acid	$17 35
54 pounds of reverted phosphoric acid	4 86
63.8 pounds of insoluble phosphoric acid	3 83
59.4 pounds of nitrogen	11 88
52 pounds of potassium oxide	2 34
	$40 26

XIX.

W. H. Bowker's Lawn-Dressing.

(Collected of Messrs. Wilder & Puffer, Springfield, Mass.)

	Per cent.
Moisture lost at 100° C.	9.69
Organic and volatile matter	64.37
Ash constituents	35.63
Total phosphoric acid	5.39
Soluble phosphoric acid	2.25
Reverted phosphoric acid	2.98
Insoluble phosphoric acid	.16
Total nitrogen	6.73
Potassium oxide	5.50
Insoluble matter, sand, etc.	.92

Valuation per ton of two thousand pounds: —

45 pounds of soluble phosphoric acid	$5 40
59.6 pounds of reverted phosphoric acid	5 37
3.2 pounds of insoluble phosphoric acid	20
134.6 pounds of nitrogen	26 92
110 pounds of potassium oxide	4 95
	$42 84

XX.

Standard Fertilizer.

(Standard Fertilizer Company, Boston; collected of Mr. George F. Baker, Marshfield, Mass.)

	Per cent
Moisture lost at 100° C.	21.87
Organic and volatile matter	50.49
Ash constituents	49.51
Total phosphoric acid	13.38
Soluble phosphoric acid	6.99
Reverted phosphoric acid	2.91
Insoluble phosphoric acid	3.48
Total nitrogen	2.50
Potassium oxide	.90
Insoluble matter, sand, etc.	4.79

Valuation per ton of two thousand pounds: —

139.8 pounds of soluble phosphoric acid	$16 78
58.2 pounds of reverted phosphoric acid	5 28
69.6 pounds of insoluble phosphoric acid	4 18
50 pounds of nitrogen	10 00
18 pounds of potassium oxide	1 62
	$37 86

XXI.

Buffalo Ammoniated Bone Superphosphate.

(L. L. Crocker, Buffalo, N.Y.; collected of Mr. B. F. Mills, South Williamstown, Mass.)

	Per cent.
Moisture lost at 100° C.	8.95
Organic and volatile matter	46.10
Ash constituents	53.90
Total phosphoric acid	14.96
Soluble phosphoric acid	6.59
Reverted phosphoric acid	3.20
Insoluble phosphoric acid	5.17
Total nitrogen	3.05
Potassium oxide	2.23
Insoluble matter, sand, etc.	4.80

Valuation per ton of two thousand pounds: —

131.8 pounds of soluble phosphoric acid	$15 82
64 pounds of reverted phosphoric acid	5 76
103.4 pounds of insoluble phosphoric acid	6 21
61 pounds of nitrogen	12 20
44.6 pounds of potassium oxide	2 01
	$42 00

XXII.

Arnold's Complete Fertilizer.

(Messrs. H. B. Arnold & Co., Boston, Mass.)

	Per cent.
Moisture lost at 100° C.	10.97
Organic and volatile matter	47.48
Ash constituents	52.52
Total phosphoric acid	11.99
Soluble phosphoric acid	4.76
Reverted phosphoric acid	4.66
Insoluble phosphoric acid	2.57
Total nitrogen	2.75
Potassium oxide	3.35
Insoluble matter	1.18

Valuation per ton of two thousand pounds: —

95.2 pounds of soluble phosphoric acid	$11 43
93.2 pounds of reverted phosphoric acid	8 39
51.4 pounds of insoluble phosphoric acid	3 09
55 pounds of nitrogen	11 00
67 pounds of potassium oxide	3 02
	$36 93

XXIII.

Soluble Pacific Guano for Sugar-Beets.

(Messrs. Glidden & Curtis, Boston, Mass.)

	Per cent.
Moisture lost at 100° C.	11.58
Organic and volatile matter	47.30
Ash constituents	52.70
Total phosphoric acid	11.80
Soluble phosphoric acid	7.42
Reverted phosphoric acid	1.41
Insoluble phosphoric acid	2.97
Total nitrogen	2.85
Potassium oxide	4.00
Insoluble matter	5.58

Valuation per ton of two thousand pounds: —

148.4 pounds of soluble phosphoric acid	$17 80
28.2 pounds of reverted phosphoric acid	2 54
59.4 pounds of insoluble phosphoric acid	3 57
57 pounds of nitrogen	10 80
80 pounds of potassium oxide	3 60
	$38 31

XXIV.

Bone Superphosphate.

(B. Randall, Boston, Mass.; Thomas Aubin, agent.)

	Per cent.
Moisture lost at 100° C.	12.61
Organic and volatile matter	50.01
Ash constituents	49.99
Total phosphoric acid	10.37
Soluble phosphoric acid	9.00
Reverted phosphoric acid	1.37
Insoluble phosphoric acid	None.
Total nitrogen	2.72
Insoluble matter	.88

Valuation per ton of two thousand pounds: —

180 pounds of soluble phosphoric acid	$21 60
27.4 pounds of reverted phosphoric acid	2 47
54.4 pounds of nitrogen	10 88
	$34 95

C. A. Goessmann,
State Inspector of Commercial Fertilizers.

Amherst, Mass., Feb. 2, 1881.

APPENDIX.

COMPOSITION OF SOME COMPOUNDS IN FERTILIZERS.

One hundred parts of —

Nitric acid contain 26 parts of nitrogen.

Ammonia contain 82.35 parts of nitrogen.

Pure nitrate of potassa (saltpetre) contain 53.4 parts of nitric acid, and 46.6 parts of potassium oxide.

Pure nitrate of soda (Chili saltpetre) contain 63.25 parts of nitric acid.

Chloride of potassium contain 52.4 parts of potassium, 63.1 parts of potassium oxide, and 47.6 parts of chlorine.

Pure sulphate of potassa contain 54.9 parts of potassium oxide, and 46 parts of sulphuric acid.

Bone phosphate (tricalcic phosphate) contain 46 parts of phosphoric acid, and 54 parts of calcium oxide (lime).

Calcined gypsum contain 41 parts of calcium oxide (lime), and 59 parts of sulphuric acid.

Uncalcined pure gypsum contain 32 5 parts of calcium oxide (lime), 46.5 parts of sulphuric acid, and 21 parts of water.

One hundred parts of —

Carbonate of lime contain 56 parts of calcium oxide (lime), and 44 parts of carbonic acid.

Sulphate of magnesia (free of water) contain 33.3 per cent of magnesium oxide (magnesia), and 66.6 per cent of sulphuric acid.

C. A. GOESSMANN.

The Committee upon Subjects for Essays and their Assignment reported as follows: —

COMMITTEE ON ESSAYS.

Advance of Massachusetts Agriculture in Forty Years	J. S. GRINNELL.
Agricultural Science of this Country compared with that of other Countries	LEVI STOCKBRIDGE.
What has Chemistry done for Agriculture?	J. R. NICHOLS.
Raising and Selecting Field and Garden Seeds,	O. B. HADWEN.
Construction of Silos; Use and Value of Ensilage	E. HERSEY.
The Influence of Agricultural Pursuits upon Personal and Domestic Happiness	A. C. VARNUM.
The Sanitary Essentials of the Home and Farm,	J. P. LYNDE.
How to keep Boys on the Farm	J. B. MOORE.

The assignments were accepted by the members designated, and adopted by the Board.

Mr. HERSEY, from the Committee upon the Revision of Rules, made a report, which was discussed, amended, and adopted as follows: —

AMENDED RULES OF THE BOARD OF AGRICULTURE.

At the business meeting of the Board held in 1867 it was

Voted, That the several societies receiving the bounty of the State be required hereafter to offer annually *three premiums*, of not less than eight, six, and four dollars respectively, for the best reports of committees who recommend the award of premiums.

In 1871 the Board

Voted, That no society receiving the bounty of the State shall bestow any premiums or gratuities on grade or native bulls.

Voted, That, in the judgment of this Board, the cattle should be kept on the grounds during the entire exhibition; and that they shall in any event be required to be kept on exhibition until three o'clock in the afternoon of the first day, unless permission in writing be given by the president of the society, for sufficient reason, to remove them earlier.

Voted, That the agricultural societies receiving the bounty of the Commonwealth be required to arrange and hold not less than three "Farmers' Institutes" each year within their limits; and that the Board will render all the assistance in its power to make such "institutes" instructive and useful to the public; and that the secretary notify the different societies of this vote.

Messrs. Bowditch, Smith, and the secretary were appointed a committee to prepare suitable resolutions upon the deaths of Mr. DAMON of Wayland, and Mr. DAVENPORT of Colraine, and forward them to the respective families of the deceased.

The Board then adjourned.

The various topics treated in the foregoing pages cover a range of subjects of especial interest to the farming community.

It has been a year of thought, inquiry, and investigation on the part of the farmers, stimulated and assisted by the frequently recurring institutes.

The experiments made by individuals, and brought to general notice at these public meetings, have been of great value, and have plainly proved the urgent need of an experiment station, to be maintained by the Commonwealth, and administered by officers appointed for that purpose.

Agricultural experiments so conducted are recognized by all enlightened governments as an essential part of modern progress. Some of the most useful information in the foregoing pages is due to the published results of the investigations made at the stations of foreign governments.

The value to us of experiments made in other countries is, however, limited by the different conditions under which we live; and the variety of soils, variation of temperature, and

rainfall on this continent, render the experiments made in one State inapplicable to the agriculture of another State.

The first experiment station was established at Bechellronn, near Strasburg, on the estate of M. Jean-Babtiste Boussinggault, professor of rural economy in the Conservatory of Arts at Paris, in 1835. In 1852 the Leipsic Agricultural Society founded the station at Moeckern, which was the parent of all the German institutions.

The importance of this humble beginning may be seen in the multiplication of stations in Germany, and in the rapid progress of the German people in scientific agriculture.

In 1879 there were seventy-nine experimental stations in Germany, spreading the results of their investigations all over the world. All Europe has been stimulated by this example; so that there are now supported by the several governments one hundred and twenty-three stations, pursuing every branch of research that may assist agriculture or horticulture.

The work of these stations is classified by Dr. A. R. Ledoux as follows: —

I. — Control of the trade in commercial fertilizers.

II. — Control of the sale of seeds

III. — Control of the sale of feeding-stuffs.

IV. — Experiments in the cultivation of plants and crops, and experiments with manures.

V. — Chemical and technical investigations.

VI. — Investigations of animals in health and disease, and feeding experiments.

VII. — Physiological examination of plants.

VIII. — Examination of soils.

IX. — Examination of wines, and experiments with the vine.

X. — Study of the diseases of plants and ravages of insects.

XI. — Examination of milk and milch-kine.

XII. — Propagation and preservation of forests.

XIII. — Cultivation and improvement of fruits.

XIV. — Experiments in reclaiming and cultivation of swamps, moors, and barrens.

XV. — Silk-culture.

XVI. — Manufactures relating to agriculture.

XVII. — Experiments relating to the sugar industry.

XVIII. — Experiments in fermentation and the manufacture of spirits.

XIX. — Examination of and experiments with beer.

XX. — Culture of the olive (at Rome).

In the United States, agriculture is our chief interest, feeding not only our own population, but millions beyond our limits. The richness of new lands, filled with the plant-food accumulated since the formation of soils, has made our people careless of scientific agriculture. They are satisfied to rob the soil, and to sell the fertilizing material that is poured from the lavish horn of Western plenty in golden crops, and to see the heritage of posterity transmitted in alien ships beyond seas. In the older States this barbarian system can no longer be followed.

Nature sets stern limits to such spoliation, and exacts the penalty. Prodigality and depletion are followed by sterility; then care, labor, and scientific knowledge must strive to restore the waste. It is recognized as sound economy for governments to assist the agricultural interest to replace the wealth of the State. Farming is and always will be an experimental pursuit. But the farmer, engrossed with the cares of his daily living, if he had the education and habit of observation, has neither the time nor means to conduct special experiments. Nor is it economy to make thousands of attempts, when one public experiment made by scientific men would suffice for all.

Connecticut, New Jersey, North Carolina, and Georgia have established experiment stations. New York has appropriated forty thousand dollars for the purpose.

This Commonwealth has an agricultural establishment at Amherst, where buildings, a laboratory, a farm, cattle, and other essentials are already provided. A small annual appropriation would be sufficient to utilize the means already at our disposal; and the farmers of the Commonwealth confidently expect legislation to that end.

JOHN E. RUSSELL,
Secretary of the State Board of Agriculture.

BOSTON, January, 1881.

THE FINANCES OF THE SOCIETIES.

FINANCES OF THE SOCIETIES.

SOCIETIES.	Amount received from the Commonwealth.	Income from Permanent Fund.	New Members and Donations.	All other Sources.	Receipts for the Year.	Premiums offered.	Premiums and Gratuities paid.	Current Expenses for Year, not includ'g Premiums and Gratuities.	Disbursements for the Year.	Indebtedness.	Value of Real Estate.	Value of Personal Estate.	Permanent Fund.
Massachusetts . .	-	-	-	-	-	-	-	-	-	-	-	-	$77,002 47
Essex	$600 00	$1,507 45	$357 00	$1,378 95	$3,843 40	$2,921 00	$1,470 25	$1,805 84	$3,276 11	-	$6,000 00	$17,500 00	23,500 00
Middlesex . . .	-	-	76 00	2,133 37	2,200 37	1,897 50	606 55	900 27	3,271 52	$16,000 00	25,000 00	200 00	6,000 00
Middlesex North .	600 00	846 51	79 00	1,034 76	2,560 27	1,217 00	754 50	1,864 00	2,618 50	1,200 00	20,000 00	-	18,800 00
Middlesex South .	600 00	-	56 10	1,630 16	1,686 26	884 50	394 80	223 46	1,462 32	-	18,000 00	-	18,000 00
Worcester . . .	-	555 00	2,268 97	-	2,823 97	8,323 00	6,728 00	12,670 00	19,398 00	37,000 00	100,000 00	-	100,000 00
Worcester West . .	600 00	-	47 00	1,719 17	2,366 17	1,247 75	1,059 05	812 35	2,229 50	1,863 33	11,600 00	750 00	11,600 00
Worcester North .	600 00	-	278 01	1,519 45	2,397 46	1,061 00	741 45	1,487 54	2,228 99	11,600 00	16,000 00	359 08	-
Worcester No.-west .	600 00	-	130 00	2,708 55	3,438 55	1,783 75	1,221 74	1,516 95	3,286 16	7,125 00	12,500 00	1,487 18	6,862 18
Worcester South .	600 00	1,000 00	95 00	2,781 42	3,476 42	1,681 00	1,357 75	1,987 59	3,626 35	-	12,000 00	500 00	12,500 00
Worcester So.-east .	600 00	-	37 00	726 06	1,363 06	1,013 25	505 40	674 25	1,179 65	11,000 00	7,500 00	900 00	-
Hampshire, Franklin, and Hampden,	600 00	334 81	135 00	1,911 72	2,981 53	1,145 25	606 00	1,554 79	2,842 93	6,636 66	7,800 00	248 60	8,048 60
Hampshire . . .	600 00	-	130 29	776 01	1,506 30	796 25	686 00	927 40	1,613 40	776 42	4,100 00	150 00	3,473 58
Highlands . . .	600 00	34 80	55 00	827 80	1,517 60	842 30	689 95	559 17	1,249 12	-	3,000 00	700 00	3,700 00
Hampden . . .	600 00	-	57 50	2,185 59	2,843 09	1,571 50	578 02	1,292 18	1,870 20	-	-	-	-
Hampden East . .	600 00	-	112 70	758 85	1,471 55	1,094 00	768 35	350 44	1,118 79	-	5,000 00	-	5,000 00
Union	600 00	-	120 00	1,792 07	2,511 07	1,150 25	798 42	1,021 97	1,820 39	-	5,000 00	1,700 00	6,700 00
Franklin . . .	600 00	120 00	90 00	1,081 72	1,891 72	845 75	655 30	1,121 87	1,771 17	1,200 00	10,000 00	1,400 00	11,400 00
Deerfield Valley .	600 00	-	234 50	821 65	1,656 15	765 00	627 00	995 35	1,522 35	1,250 00	8,070 00	88 80	8,070 00
Berkshire . . .	600 00	461 90	278 00	3,012 79	4,352 69	2,883 50	2,636 00	1,639 90	4,275 90	-	6,000 00	800 00	6,800 00
Hoosac Valley* . .	1,200 00	-	482 00	2,730 63	4,412 63	1,566 50	1,282 85	1,322 22	4,556 04	5,000 00	12,500 00	450 00	-

Housatonic . . .	600 00	27 20	187 00	4,578 96	5,393 16	3,373 00	2,804 00	2,516 93	5,242 46	-	8,000 00	1,250 00	17,817 20
Bristol	600 00	-	341 45	8,099 28	8,440 73	4,000 00	3,301 45	2,197 52	7,099 02	9,000 00	50,000 00	300 00	-
Plymouth . . .	600 00	200 00	127 00	5,141 90	6,068 90	3,113 00	2,555 23	1,271 12	5,906 49	7,000 00	40,000 00	2,000 00	40,000 00
Hingham . . .	600 00	-	167 65	3,224 85	3,992 50	1,271 00	- 531 30	2,987 27	4,018 57	3,100 00	16,000 00	2,000 00	14,900 00
Marshfield . . .	600 00	-	90 00	1,274 59	1,964 59	1,101 00	795 71	1,481 90	2,277 61	4,100 00	11,856 92	1,592 78	9,349 70
Barnstable . . .	600 00	46 62	153 65	1,035 68	1,835 95	1,099 00	720 05	1,103 25	1,823 30	600 00	5,000 00	500 00	4,900 00
Nantucket . . .	-	20 00	-	274 91	294 91	1,173 00	-	293 79	588 70	600 00	3,325 00	202 00	3,527 00
Martha's Vineyard .	600 00	129 44	30 67	275 58	1,035 69	830 25	680 38	376 92	1,057 30	86 09	2,000 00	1,900 00	3,900 00
Totals . . .	$15,600 00	$5,283 73	$6,216 49	$55,436 47	$80,326 69	$50,650 30	$35,555 50	$46,956 24	$93,230 81	$125,137 50	$426,251 92	$36,978 44	$421,850 73

* Year 1879 and 1880.

PERMANENT FUND, — HOW INVESTED.

MASSACHUSETTS. — Bank stock, bonds, and mortgages.

ESSEX. — Bank stock, railroad stock and bonds, farm, library, tent, cattle-pens, and fixtures.

MIDDLESEX. — In land and buildings.

MIDDLESEX NORTH. — In land and buildings.

MIDDLESEX SOUTH. — Grounds, buildings, stalls, sheds, pens, and tracks.

WORCESTER WEST. — Real estates and fixtures.

WORCESTER NORTH. — Real estate (thirty acres), with track and buildings suitable for exhibition. Subject to mortgage of $11,600.

WORCESTER NORTH-WEST. — Grounds and buildings, including track and fences. Personal property necessary for use. Cash, $987.18.

WORCESTER SOUTH. — Hall, land, track, and sheds.

WORCESTER SOUTH-EAST. — Real estate and personal property.

HAMPSHIRE, FRANKLIN, AND HAMPDEN. — Real estate and personal property.

HAMPSHIRE. — Real estate.

HIGHLAND. — Real estate, and notes secured by real estate.

HAMPDEN EAST. — Park, hall for exhibition, cattle-pens, etc.

UNION. — Hall, barn, scales, hall-furniture, and cash in treasury.

FRANKLIN. — Real estate and stock of Franklin-county National Bank, Greenfield.

DEERFIELD VALLEY. — Real estate.

BERKSHIRE. — Real estate.

HOOSAC VALLEY. — Real estate and personal property.

HOUSATONIC. — Real estate, personal property, notes of members, railroad bonds, and cash.

BRISTOL. — Real estate and personal property.

PLYMOUTH. — Real estate, furniture, and fixtures.

HINGHAM. — Real estate, exhibition-building, furniture, and fixtures.

MARSHFIELD. — Land and buildings used by society.

BARNSTABLE. — United-States bonds, land, and buildings.

NANTUCKET. — Land and buildings, hall, furniture, and fixtures.

MARTHA'S VINEYARD. — Land and buildings, notes of members.

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED.

SOCIETIES.	Total Amount offered for Management and Improvement of Farms, Orchards, etc.	Total Amount paid for Management and Improvement of Farms, Orchards, etc.	For Neat and Dairy Stock.	For Horses.	For all other Farm-Stock.	Total Amount offered for Live-Stock.	Total Amount paid out for Live-Stock.	For Cereals and Seed.	For Roots and Vegetables.	Total Amount offered for Grain and Root Crops.	Total Amount paid out for Grain and Root Crops.	For Fruits, Flowers, etc.	For Dairy-Products.	For Bread, Honey, and Preserved Fruits, etc.	Total Amount paid out under the Head of Farm-Products.
Massachusetts .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Essex . . .	$630 00	$174 00	$336 00	$225 00	$156 00	$1,117 00	$660 00	$28 00	$220 00	$346 00	$235 00	$390 00	$28 00	$28 00	$681 00
Middlesex . .	149 00	58 00	202 00	85 00	231 00	911 00	348 15	7 00	70 00	161 00	50 00	216 00	12 00	55 00	200 40
Middlesex North,	-	-	190 00	145 00	101 00	715 00	444 00	13 25	53 50	141 00	66 75	211 75	11 00	59 00	310 50
Middlesex South,	48 00	-	63 00	77 00	78 50	388 00	218 50	7 50	33 50	145 25	41 00	33 50	5 00	19 25	107 75
Worcester . .	-	-	2,326 00	574 00	556 00	4,340 00	3,400 00	41 00	45 00	176 00	144 00	460 00	45 00	52 00	658 00
Worcester West,	35 00	35 00	228 50	542 00	64 00	962 00	839 50	3 50	7 00	54 50	3 50	51 75	29 00	12 00	164 75
Worcester North,	-	-	98 50	76 50	94 50	305 00	227 50	26 50	24 00	61 00	30 50	80 90	16 00	23 75	144 75
Worcester N.-W.	22 00	21 00	246 00	131 00	155 00	837 50	504 32	67 00	23 00	105 00	81 66	42 25	16 00	11 00	148 15
Worcester South,	135 00	-	291 00	600 00	61 00	1,237 00	1,011 00	64 00	19 25	76 00	70 00	56 00	27 00	20 75	243 25
Worcester S.-E.,	121 50	64 00	233 00	177 00	42 50	565 50	359 00	-	25 50	94 25	9 60	37 85	13 00	8 25	30 60
Hampshire, Franklin, and Hampden,	31 00	31 00	176 00	165 00	126 50	587 00	324 25	46 50	27 25	87 00	77 75	75 75	30 00	18 00	116 25
Hampshire . .	-	20 00	159 00	103 00	84 00	404 00	346 00	8 00	63 00	78 00	71 00	77 50	12 50	24 00	185 00
Highland . .	50 00	44 00	158 25	136 50	107 50	524 25	402 25	13 50	24 75	48 00	38 25	27 50	11 00	11 00	87 75

Hampden East .	205 00	27 00	172 00	117 00	79 50	467 00	368 50	22 00	9 00	52 00	22 00	37 00	15 00	12 00	109 75
Union . . .	22 00	7 50	167 50	110 00	164 50	604 50	414 50	25 50	24 75	86 50	50 25	19 70	15 75	8 70	94 65
Franklin . .	-	-	143 00	77 00	212 99	493 00	415 30	-	20 50	87 00	25 00	113 50	16 00	19 00	175 75
Deerfield Valley,	-	-	171 00	100 00	143 00	440 00	414 00	4 25	28 70	127 95	32 95	40 75	18 50	27 00	119 20
Berkshire . .	129 00	129 00	376 00	209 00	315 50	1,088 50	900 50	219 00	114 00	361 00	361 00	96 50	39 00	40 00	536 50
Hoosac Valley .	60 00	60 00	127 00	148 00	232 00	656 00	507 00	145 25	94 50	231 00	239 75	85 25	44 00	49 50	431 00
Housatonic . .	153 00	133 00	407 00	250 00	641 00	1,304 00	1,312 00	420 00	99 00	576 00	554 00	180 00	69 00	65 00	314 00
Bristol . .	215 00	126 00	577 00	207 00	271 00	1,550 00	1,020 50	39 00	117 00	260 00	168 00	163 50	49 00	18 00	550 50
Plymouth . .	131 00	66 00	515 00	153 00	211 00	1,023 00	879 00	106 00	83 00	319 00	169 00	157 40	56 00	70 75	453 75
Hingham . .	134 00	2 00	133 50	24 00	106 25	555 25	263 75	-	21 15	102 50	21 15	98 75	9 00	28 20	158 85
Marshfield . .	52 00	26 00	113 50	60 50	72 75	359 50	246 75	17 00	73 50	98 00	90 50	117 53	22 00	37 97	268 00
Barnstable . .	171 00	58 50	115 00	30 00	114 50	310 00	259 50	14 15	54 50	197 00	68 65	98 45	9 00	27 00	203 10
Nantucket . .	98 00	-	130 00	53 50	41 75	587 00	-	19 00	32 00	147 00	-	63 60	7 00	6 50	128 10
Martha's Viney'd,	42 00	36 00	149 50	33 00	78 50	357 75	258 00	70 50	82 29	180 00	149 79	42 35	14 50	26 49	233 13
Hampden . .	233 00	17 00	169 00	87 00	30 00	637 00	238 50	7 50	11 75	172 00	31 24	78 75	13 00	15 00	116 87
Totals . .	$2,866 50	$1,135 00	$8,173 25	$4,696 00	$4,571 74	$23,325 75	$16,582 27	$1,434 90	$1,501 39	$4,572 95	$2,902 29	$3,153 78	$652 25	$793 11	$6,971 30

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED — *Concluded.*

MISCELLANEOUS.

SOCIETIES.	For Agricultural Implements.	Offered for raising Forest-Trees.	For Experiments on Manures.	Amount awarded for Objects strictly Agricultural not already specified.	Amount awarded and paid out for Trotting-Horses.	For Objects not strictly Agricultural: Domestic Manufactures, etc.	Number of Persons who received Premiums and Gratuities.
Massachusetts	–	–	–	–	–	–	–
Essex	$44 00	$30 00	$25 00	–	–	$199 25	610
Middlesex	28 00	5J 00	–	–	$700 00	156 50	99
Middlesex North	–	–	–	–	–	–	121
Middlesex South	2 00	45 00	–	–	147 50	58 50	115
Worcester	107 00	–	–	$110 00	1,700 00	467 00	–
Worcester West	–	30 00	10 00	–	469 00	54 46	222
Worcester North	24 00	25 00	–	–	225 00	152 50	201
Worcester North-west,	6 00	30 00	–	–	491 00	89 36	–
Worcester South	7 00	35 00	–	–	430 00	15 50	152
Worcester South-east,	–	15 00	–	–	–	100 00	170
Hampshire, Franklin, and Hampden	22 75	20 00	–	–	405 00	87 00	192
Hampshire	10 00	8 00	–	40 00	235 00	85 00	223
Highland	4 00	–	–	–	37 00	91 45	219
Hampden	34 00	30 00	15 00	–	150 00	61 00	153
Hampden East	17 75	25 00	86 00	–	195 00	50 35	140
Union	6 75	–	–	20 70	162 00	92 50	184
Franklin	–	10 00	–	–	–	67 73	220
Deerfield Valley	–	–	–	3 00	–	90 80	400
Berkshire	60 00	–	–	24 00	545 00	441 00	–
Hoosac Valley	20 00	–	10 00	24 50	510 00	240 35	310
Housatonic	–	–	–	30 00	497 00	399 00	755
Bristol	44 00	23 00	60 00	30 00	1,489 00	385 40	475
Plymouth	7 00	60 00	–	18 00	815 00	270 08	512
Hingham	–	50 00	–	5 55	–	101 15	291
Marshfield	4 75	50 00	–	–	164 00	148 15	609
Barnstable	–	7 00	12 00	–	75 00	123 95	116
Nantucket	–	13 00	16 00	–	–	77 00	–
Martha's Vineyard	–	13 00	10 00	–	–	140 25	237
Totals	$449 00	$569 00	$244 00	$305 75	$9,441 50	$4,245 23	6,726

ABSTRACT OF RETURNS

OF THE

AGRICULTURAL SOCIETIES

OF

MASSACHUSETTS.

1880.

EDITED BY

JOHN E. RUSSELL,
SECRETARY OF THE STATE BOARD OF AGRICULTURE.

BOSTON:
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1881.

OFFICERS OF THE AGRICULTURAL SOCIETIES, 1881.

MASSACHUSETTS.

President — THOMAS MOTLEY of Jamaica Plain.
Secretary — EDWARD N. PERKINS of Boston.

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President — BENJAMIN P. WARE of Marblehead.
Secretary — CHARLES P. PRESTON of Danvers.

MIDDLESEX.

President — JOHN CUMMINGS of Woburn.
Secretary — BENJAMIN W. BROWN of Concord.

MIDDLESEX SOUTH.

President — W. G. LEWIS of Framingham.
Secretary — C. A. HEMENWAY of Framingham.

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Secretary — ENOS W. BOISE of Blandford.

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Secretary — SAMUEL D. CONANT of Greenfield.

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HOOSAC VALLEY.

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President — R. E. BURGESS of Nantucket.
Secretary — WENDELL MACY of Nantucket.

MARTHA'S VINEYARD.

President — WILLIAM COTTLE of Tisbury.
Secretary — B. T. HILLMAN of Chilmark.

AGRICULTURAL EXHIBITIONS, 1881.

ESSEX, at *Haverhill*, Sept. 27 and 28.
MIDDLESEX, at *Concord*, Sept. 28, 29, and 30.
MIDDLESEX NORTH, at *Lowell*, Sept. 27 and 28.
MIDDLESEX SOUTH, at *Framingham*, Sept. 20 and 21.
WORCESTER, at *Worcester*, Sept. 6, 7, 8, and 9.
WORCESTER WEST, at *Barre*, Sept. 29 and 30.
WORCESTER NORTH, at *Fitchburg*, Sept. 27 and 28.
WORCESTER NORTH-WEST, at *Athol*, Oct. 4 and 5.
WORCESTER SOUTH, at *Sturbridge*, Sept. 15 and 16.
WORCESTER SOUTH-EAST, at *Milford*, Sept. 27, 28, and 29.
HAMPSHIRE, FRANKLIN, and HAMPDEN, at *Northampton*, Oct. 5, 6, and 7.
HAMPSHIRE, at *Amherst*, Sept. 22 and 23.
HIGHLAND, at *Middlefield*, Sept. 15 and 16.
HAMPDEN, at *Holyoke*, Sept. 27, 28, and 29.
HAMPDEN EAST, at *Palmer*, Sept. 20 and 21.
UNION, at *Blandford*, Sept. 21, 22, and 23.
FRANKLIN, at *Greenfield*, Sept. 29 and 30.
DEERFIELD VALLEY, at *Charlemont*, Sept. 22 and 23.
BERKSHIRE, at *Pittsfield*, Oct. 4, 5, and 6.
HOOSAC VALLEY, at *North Adams*, Sept. 20 and 21.
HOUSATONIC, at *Great Barrington*, Sept. 28, 29, and 30.
BRISTOL, at *Taunton*, Sept. 27, 28, and 29.
PLYMOUTH, at *Bridgewater*, Sept. 21, 22, and 23.
HINGHAM, at *Hingham*, Sept. 13 and 14.
MARSHFIELD, at *Marshfield*, Sept. 14, 15, and 16.
BARNSTABLE, at *Barnstable*, Sept. 27 and 28.
NANTUCKET, at *Nantucket*, Sept. 7 and 8.
MARTHA'S VINEYARD, at *West Tisbury*, Oct. 4 and 5.

AGRICULTURE OF MASSACHUSETTS.

COMMITTEE REPORTS.

ON STOCK IN GENERAL.

[Franklin-county Society.]

THE exhibitions of neat-cattle and other animals at our annual cattle-shows have for years past been so similar in numbers and in quality, that the reports on "the stock in general" have become successively repetitions of favorable notices of the animals and their owners. A marked exception to this, however, was the report of Mr. Oakman, two years ago, admirable for its fulness and its sound suggestions.

Not much remains to be said this year beyond a brief notice of the stock, and a reiterated call upon the farmers in the county to continue in the improvements they have made, and to devote more attention to three or four important subjects, as sheep-husbandry, the dairy, wheat-growing, the hay-crop, and poultry.

The weather on both days of the fair was splendid, — a glorious termination of one of the most prosperous seasons with which we were ever favored, — and was a strong and successful inducement for the farmers to bring out their cattle.

Good pasture and abundant crops of all kinds had brought the animals to a fine condition, filling the hearts of their owners with cheerfulness, and their pockets with substantial evidence of success, and lightening their labors with prospective visions of great gain from the ingathering harvest, which now has realized their full anticipations.

Our beautiful and convenient grounds, with ample accommodations, an admirable track, a dry and level surface, with a full supply of running water, never gave greater satisfaction than on those two days.

About nine o'clock the stock begins to come, though some

is brought in the night before; but eleven o'clock hardly sees the cattle arranged, and committees at work: and it is all too short a time to make thorough examinations of the animals for those really interested; while the impatient drivers can hardly be restrained from taking them from the grounds before half-past two in the afternoon, — the hour prescribed by the Board of Agriculture as the earliest period at which cattle can be driven away.

It would be most desirable, if we had a few more covered pens, to have the cattle and sheep kept over night and into the second day, as is done in some societies. Hay and grain would be furnished gratuitously; the milk would all be bought at the market-price; the beasts would all be in a better condition to be driven home; and a greater opportunity would be given to examine the stock, not only by the judges, but by all interested, to compare different animals and herds, to discuss their merits, and to criticise the different modes of breeding, raising, and feeding; to sell or exchange animals or products; and, last and least, it would give two or three hours of the first day to be occupied in trials of speed in horses raised in the county, — more entertaining to a large number of spectators than the more useful observation of the other animals of the farm on exhibition. Some of the best stock, coming from a distance, was, as heretofore, kept comfortably the night preceding the fair, showing, that with extended conveniences, all might be well enough housed and cared for on the first night of the fair, as on the night preceding. At all State shows, cattle are kept in suitable sheds or stalls for three and four days.

The entries of neat-cattle and calves amounted to ——; not so large a number as we have sometimes had, but never surpassed in quality.

Our county has always been prominent in the raising and keeping of neat-stock; and for years we were the second or third county in the value of that branch of farm-product. But although, in later years, the three large counties, by a greater city and town consumption of milk, have exceeded us in number and value of milch cows, yet we may be well satisfied in having surpassed ourselves; for while, forty years ago, we had 25,653 cattle, worth $440,173, in 1875 we had 7,797 less cattle, but worth $289,042 more than those, show-

ing a wonderful advance in the value of our stock, and giving great encouragement in the continuance of well breeding.

The reports of the committees on the various branches of the exhibition having been made and published, I do not propose to speak particularly of any animals, — herds or breeders; but I can say that the show of Short-horns was never better, including one of the finest bulls ever shown, and animals from the best herd in New England.

There was a full display of cows, steers, heifers, and calves, thorough-bred and grades of superior style; and the old glory and pride of Franklin County was well sustained by twelve yokes of fat cattle from the old towns of Shelburne and Deerfield, the average of which was over thirty-seven hundred and fifty pounds.

Again I have to regret the absence of that noble breed, the Herefords, — the best beef, excellent workers, and fair for milk. Their splendid forms and color, white faces, and open horns, make them a conspicuous and beautiful sight when living, and very tempting in the shambles. One solitary bull stood the only representative of his noble family.

The Jerseys made a fine show, as they always do and will in our butter-making county. Thirty-three years ago, Mr. George Bird sent here the first Jerseys ever seen in the county; and it was a long time before our farmers, accustomed to the lordly Short-horns, could realize the excellence of the small and unrounded forms of the butter-producing Jerseys, which now successfully contest for the palm, against their majestic sisters, over the milk-pail. No Ayrshires nor Devons, good for the dairy and the yoke, were offered; and a "native" is now unknown.

In this county the dairy yields the largest marketable production of our farm industry, and should be most carefully watched and advanced. In 1875 our butter, at an average of thirty-five cents, amounted to $414,977, and our cheese to $9,065, at thirteen cents. I think at the present time we make more butter; but the average price is somewhat less, though Franklin-county butter in years back has held the highest rank in Boston market, and will continue to, if the farmers and farmers' wives will bestow the necessary pains to make the best butter, which they can do — but probably won't.

Of sheep, the show was exceedingly good in coarse and middle wools: fine wools "are extinct as fire among thorns."

The enormous capacity of the vast prairies and ranches of the West and South-West for the growing of sheep and the production of fine wool, with limitless means of transportation, has rendered that branch of industry comparatively unprofitable here: but, on the other hand, the increased consumption of mutton and lamb at the East has largely developed another line of sheep-husbandry in coarse and middle woolled sheep for their meat, aided, also, by their fleeces of combing and delaine wool, which are worth as much per sheep as the Merino; while the carcass is worth many times as much. In 1875 our county made more than one-fourth of all the mutton produced in the Commonwealth, and our fat lambs (nearly ten thousand) outnumbered those of any other county in the State. Our mutton brought us nine cents per pound; and, while many of our earliest lambs sold at from seven to ten cents, the average of the whole, early and late, was four dollars and a half each, or seventy-five cents above the average of all the lambs in the State; and the sheep averaged about half a dollar a head more than all others. In 1845 we had 49,797 sheep; thirty years later, only 11,318, — a decrease of 38,000.

Unwise, thriftless, and stupid as has been the course of many of our farmers to quit entirely a paying and pleasant branch of farming if judiciously conducted, the few who have continued in it have, by their skill and good judgment, partially redeemed us, and have shown what may be done. They have made their sheep to average four dollars and a half each, which in 1845 were valued at a dollar and sixty-seven cents each; and the lambs then worth a dollar and a half they have brought to the average of four dollars and a half each, and no end to the demand. The wool, too, from these sheep has come to four and six pounds, worth forty-two cents, against two pounds and fourteen ounces at thirty-eight cents in 1845.

With all these facts so plainly before them, it is not strange that many of our farmers are entering earnestly into the business of keeping sheep, raising early lambs, and making mutton.

For a reliable basis in this business, the Downs must be

taken, — South-downs, or as good grades as can be found or made. Shropshire or Oxford-down rams, when they can be had, crossed in, add size and wool, without detracting from the splendid mutton qualities, aptitude to fatten, quiet disposition, and perfection of form for the butcher, with tendency to twins, and great capacity for milk found in properly bred South-downs. Many of our farmers like to take a cross of Cotswold, Leicester, or Lincoln for size of carcass, and length of staple in the fleece. This may do for a cross; but I doubt the capacity of our pastures generally to carry so heavy sheep as the Cotswolds, without deteriorating the sheep. But let it be thoroughly tried.

A class of large-graded Merinos, probably from the French, is held in much esteem by some, as producing large lambs with more fleece. It is also claimed that there is a decided tendency in the Merino ewes to receive the ram some weeks earlier than the other breeds having their origin in a northern climate. If this characteristic of the Merino grades be an established fact, it is a very desirable one for those who wish their lambs dropped early in January, that they may be ready for market by Easter, when they fetch from ten dollars to fifteen dollars each. I hope to get the experience and opinions of some of our farmers on this point before the winter institutes are over.

We cannot, however, expect to have this line of profitable farm industry extended as it should be, until an anti-canine millennium shall dawn on our Great and General Court, and give them light and sense and independence enough to legislate for the protection of our harmless, necessary sheep, against the bloodthirsty, carnivorous brother of the wolf.

Each succeeding year seems to be harder for sheep-raising than the previous one; and we almost despair of relief as we see in the indifferent legislator the grasping dog-owner and pot-hunter, and an occasional selfish farmer, who, having lost no sheep himself, desires a repeal of all dog laws, — a trinity for the encouragement of mischief, and the suppression of industry.

There were exhibited some very excellent Cotswolds and their grades, and a very good display of grade South-down ewes, which had given their owners many lambs and much profit. I noticed some handsome ewes graded from Mr.

Moody's fine importation of Shropshires, which would have been more numerous but for the unconquerable fondness of dogs for mutton.

There were eighteen entries of swine, which, considering the inconvenience of handling and loading these somewhat intractable animals, is very good. The Chester Whites, Poland-Chinas, and Suffolks were excellent, as also were some of the Yorkshires, which, introduced by the Massachusetts Society, are becoming very popular. They have the "chunkiness" of the Suffolk, with more hair and a little more size. Of the improvement in the swine of the county, we have proof in the fact that the 3,441 hogs of 1875 were worth $8,230 more than 6,616 of 1845, then appraised at six dollars and a quarter each, and in 1875 at fourteen dollars and a half.

Of poultry there was a most creditable display, — good evidence that this branch of farming is not quite neglected. There were eighty-one coops, one-fourth of which were entered by one young farmer, an enterprising son of a worthy father. By the federal census of 1840 the poultry of this county was estimated at $9,678. No returns were made in 1850, 1860, or 1870; and with equal stupidity and ignorance they were almost as much neglected in our State enumerations of 1845 and 1855. In 1865 the poultry and eggs were set down at $18,000, but in the admirably prepared schedule of 1875 they are returned for this county at $90,538, of which the eggs are about one-half. Does this not show an industry, that, while individually small, making a very great aggregate, should be encouraged and fostered? A convenient plan for exhibition and more liberal premiums are due to a class of farm-stock, which, in its own and productive value, exceeds that of the sheep and wool, the swine, calves, colts, steers, and heifers in the county.

The second day was perfect, and a large number attended to see such horses as were for exhibition. The show generally was fair, of colts remarkably good. This is not a horse-breeding county; and the tone of morality in the county, though perhaps rather thin, is extended enough to interdict trials of speed. Nevertheless we have much improved in the character and style of our horses, as well as increased their numbers. In 1845 we had 3,775 horses, valued at $162,322,

or at $43 each; in 1875 we had 4,098, valued at $423,398, or over $103 each. It would seem that a class of farm-stock of great value, and showing such a great increase, should be entitled to very high privileges and great encouragement.

I think, for the entertainment of the people at large who want a holiday, and very properly take this as such, and seek to be amused in a cheap and harmless manner, and who, with that instinct common to every human being, delight to see rapid motion, — a swift-moving horse being one of the most attractive sights in nature, — the Society might arrange to give for fast-trotting or running horses raised in the county, or owned there for three months before the fair, handsome premiums, with very positive advantage to its funds, to the great enjoyment of a large number of people, and with no very pernicious result to the morals of the community.

The whole show was excellent in kind, successful as an exhibition, and profitable in results, doing credit to the farmers of the county and to their efficient and painstaking officers.

JAMES S. GRINNELL,
Committee on Stock.

REPORT ON SWINE.

[From the Report of the Committee of the Hampshire Agricultural Society.]

It is no part of the work of your Committee in this report to recite the history of the hog, or to trace, step by step, the work of domestication and breeding by which this animal has undergone such wonderful changes as scarcely to be recognized as having descended from the wild boar, but simply to present such hints and suggestions in their care and management as it is hoped may be of some special benefit to those for whom it was written. How the farmers of New England shall manage their hogs so as to derive the largest amount of profit, and thus, perhaps, be able to successfully compete with the Western farmers in supplying our own markets with pork, is a question that interests no small proportion of our farmers at the present time.

The farmers of fifty or seventy-five years ago, in certain portions of this State at least, looked upon the keeping and fattening of hogs as one of the most important and valuable means of disposing of their grain, and adding to the profits of their farming. While liberal quantities of pork were cured for home use, a large amount was annually transported by teams to Boston, and there either exchanged for cash or the yearly supply of groceries. Now this, to a great extent, is changed. By means of the railroads, our farmers are brought into direct competition with the great grain-growing sections and interests of the West. The increased attention bestowed on the improvement of their breed of hogs, and the rapid strides which have taken place in the business as the outgrowth of these improvements, and the problem which the Western farmers have solved in sending their cheap grain to our Eastern market in the shape of pork (or as one writer states it, "of sending thirty bushels of grain in a three-bushel barrel"), has given the Western farmer no small advantage. This competition, instead of discouraging, should stimulate, our farmers to secure the very best breeds, and to

pursue such a wise system in their care and management as shall make this department of their farming pay. It can be done; and our farmers owe it to themselves that they do this, or cease to keep that which so many now declare to be so unprofitable. Such farmers, however, should blush to own themselves beaten by the humble Irish cottager, who, with few if any of the natural resources such as are incidental to a well-managed farm and dairy, finds it highly profitable to keep one or more "gintlemin," that, if necessary, goes to pay the "rint," or to furnish himself and family with their year's stock of meat.

SELECTION OF BREED.

No small amount of the profits in feeding pigs will depend upon the breed: therefore, in selecting the hog best adapted to the wants of the New-England farmer, an animal neither too large and coarse, nor one too small, should be chosen. While in some sections a black hog is all the rage, the color being no objection, in others it is looked upon with such dislike, that, however excellent the breed or the animal, it is condemned. Therefore, the farmer who intends to breed pure bloods to sell for breeding purposes, or expects his neighbors to use his thorough-bred sires to cross on common sows, will do well to consult the taste of the farmers of the locality in which he lives.

With the great advantage to be secured by the use of the best improved breeds, which skilful and money-making farmers have not been slow to discover, it is unaccountably strange that there should be a class of farmers so blind to their own interests as to continue to keep and breed the "Racer" or "Landpike" breed in nearly its original purity. These original subsoilers are never quiet, — either squealing, rooting, or tearing their pens to pieces all the time. No wonder their unfortunate owners bewail the hard times, and speak the truth when they say that their hogs are a dead loss to them, eating themselves and their owners out of house and home. Why such stock is kept from becoming extinct is because there exists a class of farmers so unwise, that they think it is just as well to breed from a boar, the service of which they usually get for nothing, as to patronize the use of a good thorough-bred, for which one or two dollars is charged.

We have had some experience in breeding pure-blood hogs first and last; and while we would not discourage any one from engaging in the business with a view to supplying the demands for such stock for breeding, and for the purpose of fattening, still we would especially recommend such breeds as the Suffolk, Essex, small and medium Yorkshire, and Berkshires, to cross with the common stock of the country. No matter how coarse and common the sows may be, if bred to a good boar of one of the above breeds, the result will be the most satisfactory. Why? Because the offspring will possess all the good qualities of the sire. These are: 1st, gentleness; 2d, small bones and light offal; 3d, good feeders, making the most of what they consume; 4th, easy to fatten at any age. These, with the strong, vigorous constitutions which they receive from their dam, will make them the *ne plus ultra* of a family pig for fattening.

SELECTION OF THE MALE.

The selection of the male in breeding is of the first importance. Not only should he be a thorough-bred, but, what is of still greater importance, he should be well bred. We are sorry to observe that many worthless animals are saved, and sold for breeding-purposes, for the reason of their "fancy pedigree," or because they were from imported stock, or were raised by Col. So-and-So, or out of stock that cost so many hundreds or perhaps thousands. Too many specimens of this class have found their way among the farmers. There could be but one result of breeding from such stock. For this reason, pure bloods are not looked upon with that favor to which their merits entitle them, and which they would have received, had it not been for the dissemination of this worthless stock.

We do not believe it best to breed from so-called native male animals, when the use of good thorough-bred males, that produce such vastly superior results, can be secured without too much trouble or expense. But, poor as these native scrubs sometimes may be, we know of no animal that is quite as worthless as a *thorough-bred* scrub. Never be deceived into purchasing or using animals of this sort. For breeding-purposes, as well as feeding, select an animal with broad, deep chest, broad loin, large ham, fair length of body,

but not too long, straight on the back or slightly arched (never hollow), small bone in proportion to the flesh, short leg and small feet, small head with wide heavy chaps, short nose, broad between the eyes, small thin ear, body neither too light or heavy coated with hair. He should be selected from a family that shows uniform good qualities. Those which run even, look alike, well marked, etc., are the ones to select from, every thing else being equal.

SELECTION AND MANAGEMENT OF BREEDING-SOWS.

In selecting sows with a view to breeding, choose those that are long and rangy, what might be called rather coarse for the breed, rather than those fine-drawn, compact, chubby ones. Look to the male for the *fine* point rather than to the sow, if even, well-bred pigs are desired. Even with the best of management, there is considerable liability of loss in getting a litter of pigs through the first two weeks of their lives. The tendency of the sow to devour her young is usually the result of costiveness and its accompanying evils. Breeding-sows need exercise, and plenty of green food, if in its season: if not, feed plenty of coarse bran and roots, but little, if any, meal. The fact is we consider corn the least desirable food that can be fed to a sow in farrow, for the reason that it causes her whole system to become feverish and inflamed. If a clear grain diet must be fed, we know of nothing as safe as oats. They are less heating than most other grains, and the thick skins cause a healthful distension of the bowels. Their food, if possible, should be varied, and abundant enough to keep them thriving, yet not sufficient to fatten them. An occasional dose of sulphur in their food, as well as charcoal, a supply of which should be constantly at hand, should be given twice a week. It promotes their health by helping digestion, improving their appetite, etc. They should have access to pure water, and the feed should be occasionally salted. The good luck which some farmers almost invariably have in raising pigs is the result of good management. If a breeding-sow is properly fed, kindly treated, and petted, she seldom disappoints her owner. Unless one has a suitable place where the sow and pigs will not suffer from the effects of the usually severe cold at that time, we do not believe in having our sows drop their litters in mid-winter.

There is much less danger of loss, and we think it far better, to have them dropped in April; and, if full fed all the time until the first of December, they will dress from three hundred to four hundred pounds. After farrowing, the sow for a few days should be disturbed as little as possible. Her food for the first few days should be warm and sloppy, and small in quantity. If she is doing well, and is quiet, and takes good care of her little grunters, "let well enough alone." After a week or ten days, feed more liberally. Nothing we ever found is equal to skim-milk and oatmeal for making a sow give a large quantity of milk, and the pigs to flourish. Next to this would be corn-meal thoroughly cooked, and made into a gruel, with sufficient bran in it to keep the bowels open, and to give a more glutinous diet. Before the sow farrows, if a rail is placed around the side of the pen one foot from the side, and eight or ten inches high, there is less liability of the mother lying on her young before they have acquired sense or strength enough to avoid the danger. Pigs should not be put to breeding too early: eight or nine months is early enough. If a sow in breeding shows a quiet disposition, and has a reasonable number of pigs, and proves to be a good mother and milker, she should be kept; for a sow seldom throws her best and most vigorous progeny until she has arrived at the age of two or three years.

IN-AND-IN BREEDING

is especially to be avoided, if the breeder wishes to maintain size, vigor, fecundity, and constitution. However successful the practice of in-and-in breeding may have been in improving and establishing certain families and breeds of domestic animals, it is a practice to be carefully avoided by our farmers in the breeding of swine. We have known what was originally a profitable breed of hogs, dwarfed and deformed by a continued course of this practice, and so completely "run out" as to be in a few generations comparatively worthless.

MANAGEMENT OF PIGS.

While it is highly desirable to start with the right kind of hogs, let the breed be what it may, the fact that the feed makes the hog, to a great or less extent, must not for once

be overlooked. Without good feeding it is impossible to secure the full benefit of well-bred stock. For this reason, the swine claimed to have originated out of "swill pail" by "corn bin" are usually fat, showing the result of good feeding, if not good breeding. If sows are served in December, they will farrow in April. The period of gestation is usually sixteen weeks and three days. When the pigs are two or three weeks old, they should be fed in an enclosure separate from the sow, with milk in a small trough. They learn quickly; and, although they take but little at first, as they grow they consume more and more: so that, by the time they are ready to be taken from the sow, there will be no check to their growth, besides being, if properly fed, much larger than pigs that only suckle the sow, and superior to them. The drain on the sow will be much less: therefore she will be in better condition for immediate breeding again. We never found any thing quite equal to milk to make pigs grow. Next to this are oats ground fine, and made into a gruel or porridge, and thoroughly cooked.

Six or eight times a day is not too often to feed young pigs. Give them all that they will readily eat up clean, and no more. Do not overfeed: "little and often" is the golden rule. When the pigs are three months old, three times a day will answer. Be regular in feeding. Feed just strong enough to keep the stock in a good growing condition, but not to fatten. We are satisfied that it pays to cook or scald the meal fed to growing pigs, or what are commonly called shotes. This is easily done by placing the feed, say one half meal, and the other half coarse bran, in an empty barrel that is sufficiently tight to hold water. Pour upon the feed sufficient boiling water to thoroughly scald it. This is to be covered up, and allowed to stand until next day's feeding; or, in other words, the food is prepared before it is wanted in order to give the meal time to cook and swell. As needed, it can be made thin and sloppy, either with milk, or slops from the kitchen, or water. Up to the time of fattening, we prefer to scald the feed; but, for fattening, we have serious doubts as to there being any thing gained by this practice. It is true the feed goes further, from the fact that they cannot eat so much on account of its bulk. But it takes longer; and, where the object is to induce the animal to eat all he can digest, bulky

food is an objection. The prevalent custom of deferring the fattening until cold weather is not good economy. Much food might be saved, and a hog's growth much increased, if this fattening process was well under way before cold weather comes on. Give such animals a warm, dry shelter; for warmth is equivalent to food, and the comfort and quietude thus secured tend to the secretion of fat.

HOG-PENS.

It is worse than folly to expect an animal of any breed to do well if kept in small and filthy pens. Farmers who cannot afford to give their pigs a dry place, but oblige them to live in a hole reeking with filth and mire, eating out of a trough perhaps half full of the same material, ought never to own, or have the care of, a hog of any kind, let alone any of the improved breeds.

It is painful to see such stock, as is too often the case, deprived of suitable shelter, their pens open to rain, snow, and mud, the little straw they chance to have as wet as rain and mud can make it, squealing their discontent "in tones that drown the wintry blasts." Shame on such neglect and abuse! Treat and let them live the very aldermen of the farmer's stock; and then, if they do not flourish and grow fat under such easy circumstances, they are not worthy of their name and breeding. However desirable it may be in point of convenience to have the pens within easy range of the kitchen, yet it is a barbarous custom, and one which cannot be too severely censured. Many an otherwise attractive farmer's home is made unhealthy, besides being unsightly, in consequence of the offensive smell and noise that penetrate the house because the owner must needs give the hog house and yard a commanding position in the foreground. If the pig-sty be placed where it properly belongs, it certainly will not form a part of, or be closely connected with, the dwelling where the farmer and his family live.

MAKING MANURE.

If properly managed, the hog can be made of practical use in the manufacture of a large amount of valuable manure. The excrements of the hog, owing to the concentrated food upon which it is fed and fattened, are among the

most valuable manures upon the farm. The disposition of this animal to root and exercise should be encouraged when young, especially in such animals as it is intended to keep for breeding-purposes; for it not only tends to develop a stronger and more vigorous constitution, but, if suitable material is furnished in a yard attached to the pen, they will work over, and convert into a valuable fertilizer, such waste stuff as weeds, potato-tops, leaves, rubbish from the garden, etc. These, with an occasional load of loam, will in a season secure a mass of material that will be worth not less than ten dollars for each animal that is kept and fattened to the age of eight or nine months. It is a great mistake for farmers to neglect this advantage of the manufacture of manure, and to rely, in its stead, upon commercial fertilizers. The sad results of this unwise course are only too often apparent.

DISEASES OF HOGS.

The value and importance of the hog as food is a sufficient reason for guarding with scrupulous care the health of this animal. Too often reared in filth, and slaughtered in disease, it is not strange that the use of pork is unpleasantly suggestive of "cholera" and "trichiniasis." It is safe to say that most of the diseases of swine are the results of inattention and neglect. Give the hogs clean pens, a large yard or lot in which to exercise, and access to fresh earth, healthful food, pure water, and seldom, if ever, will they be troubled with disease. Study to promote the comfort of all the creatures in your keeping, if the best results are desired, and you wish to prove yourself a humane man.

For hogs that are kept closely penned, an occasional dose of sulphur is thought to be beneficial. The same can be said of charcoal. An occasional scrubbing with the aid of a brush, warm water, and soap, not only adds to their looks, but promotes their growth and comfort. For mild cases of diarrhœa, give the pigs fresh skimmed milk thickened with wheat-flour. For measles, kill or get rid of the animal that has them. That is the best way to treat such diseased stock. Let some one else doctor, and eat them afterwards if they chance to live, — not you.

BREEDS OF SWINE.

Before we proceed to notice the various breeds that are deserving the attention of those in search of pure-blood stock, it might be well to observe, that many persons engage in breeding such stock solely for the purpose of supplying their neighbors and the public with the same at "fancy prices." Not unfrequently such breeds soon have their run; but this class of speculators are all sold out at just the right time, and are now in for something else that's new. These men are not breeders: they know little or nothing about the art of breeding. Therefore, in purchasing new and improved breeds of any kind, never allow this spirit of speculation to enter into your plans. Let the motive be to help improve the domestic animal. Thus our farmers, by securing the best breeds and their crosses, not only secure to themselves increased profit, but embellish their farms with that which will afford them a new interest, and a satisfaction not to be found in the ownership and breeding of inferior stock.

THE ESSEX.

This is a favorite breed with those who have given them a fair trial. For the production of nice pork for family use, it is claimed there can be nothing superior. They certainly have a larger per cent of lean meat, and less of that gross, oily tendency, to which the Suffolk runs. They are a thoroughly established breed, good families of which will reproduce themselves as near alike as two peas. They are remarkably quiet and gentle: "no other breed equals them in this respect," it is claimed. Small-boned, light offal, easy to keep, and good grazers. To cross on coarse sows they are especially recommended. We do not think it would pay to keep the breed simply for the production of pork, unless customers are willing to pay an extra price for a nice article. They are pure black in color, rather small, but very compact.

YORKSHIRE.

The Yorkshire is one of the oldest of the white breeds of swine. They are generally divided into the large, small, and middle breeds. The small Yorkshires are a quiet, easy

hog to keep; and it is claimed that "no animal of the pig species carries so great a proportion of flesh to the quantity of bone, or flesh of so fine a quality, as the small Yorkshire." There have been several of these hogs imported into this State, and so far they have given very general satisfaction. The middle Yorkshire are larger, not quite so highly refined or compactly built as the small, but are a desirable breed. The large Yorkshire, of which several have been imported into this State, are a much larger size than either of the others. Six or eight hundred pounds are common weights, and as high as twelve hundred pounds has been secured by English breeders. Considering the enormous size of these animals, they are not coarse. Their shape is generally good, the legs straight, the back generally arched, and well calculated to sustain great weight. We know of no one who has met with any special success in the breeding or fattening of these large Yorkshires in this country.

CHESTER (COUNTY) WHITE.

This American breed, which was introduced several years ago from Pennsylvania, for a time had a tremendous "run." One firm alone in Chester County, Pennsylvania, it is claimed, shipped from twenty-five hundred to twenty-nine hundred of these pigs each year. Owing to the great demand, and the dishonesty of dealers, many worthless animals were shipped, and scattered over the country, which naturally brought this breed into bad repute with some. A well-bred Chester White, if not too coarse (and large size is wanted), is a desirable kind of hog. The sows of this breed, owing to their size, strong digestive powers, hardiness, and vigorous constitution, and being usually good milkers, make most excellent stock to cross refined English breeds of hogs upon. They are pure white, have long round bodies, short head and legs, are hardy, prolific, and good milkers.

THE SUFFOLKS.

This breed, now so seldom seen either in the pens of our farmers, or at our annual agricultural fair, was, twenty years ago, a more common and deservedly popular breed. They are a very quiet, easy animal to keep, and fatten readily at any age. Generally, however, the pure bloods were most

too fine drawn: they were too lightly coated, and lacked muscular strength and hardiness of constitution. The males make most excellent sires to cross with the coarse, common stock. It is generally conceded that their introduction into this State and county was the means of greatly improving the swine, and thus adding greatly to the wealth of our farmers. Two fair specimen boars of what might be called Suffolk and Yorkshire crossed were entered, and received first and second premium at our late fair in Amherst.

POLAND-CHINA.

This breed originated in Southern Ohio, and was the result of crossing several breeds with the Berkshire as a basis. They are a large hog, and perhaps better suited to the wants of the farmers of the West, than those of the East. "This breed is very hardy, profitable to feed, and will, it is claimed, dress three hundred pounds at nine or ten months, and, if kept growing until eighteen or twenty months, will fall little short of five hundred or six hundred pounds." When well bred, they have long, deep bodies, bone medium to large, broad and straight back, good square hams and shoulders, short legs, small head, irregularly spotted white and black. At the West this breed fairly divides the honors with the Berkshire. Crossing this breed by the use of pure Berkshire sires gives a most satisfactory result in stock for fattening. They are far superior to the full-blood Poland-China, if early maturity, small bone, little offal, and economy of feed be desired.

THE BERKSHIRE.

Among the several improved breeds which prominently claim the attention of our farmers, there are none, we think, more deserving of notice than the Improved Berkshire. They are an English breed, established many years ago. No pure bloods that we ever tried excel them either for fattening purposes, or for crossing on common stock. The Berkshires are thin-haired; but the skin is almost always healthy, smooth, and elastic. In size they should be classed as medium, although now and then a specimen develops a size that should be reckoned with the large. Experience has proved this breed to be very hardy, prolific, and excellent

foragers. When properly fed, the pigs can be made to weigh from three hundred to five hundred pounds at a year old. The young pigs are thrifty, grow very rapidly, and are easy to fatten at any age. Their hams are celebrated as the finest in the world. The true Berkshire is docile, short-legged, sound in the loins; ears thin, small, and erect; straight back, of uniform width from shoulder to ham, very full and deep in the ham and shoulder; face short, fine, and well dished, broad between the eyes, which are large, bright, and intelligent; color black, with white on feet, face, and tip of tail. With the merits which this breed possesses, it is no wonder, that, where they are best known, they are deservedly popular.

For the Committee.

A. B. Howard, *Chairman.*

POULTRY.

[From the Report of the Committee of the Bristol-county Society.]

The Committee on Poultry respectfully submit the following report: —

The show of poultry was not so large as last year, but of great merit, embracing fowls of most of the leading varieties, all pure breeds, affording satisfactory evidence of an increased regard for pure-blooded poultry, and a determination to improve the stock to a point of excellence not even aimed at a few years ago.

Your Committee, in years past, took the liberty, in making their report, to impress on the minds of poultry-breeders the importance of breeding from pure blood and the very best stock.

We are gratified by the belief that our reports are very extensively read, and that they are generally approved by our largest breeders, and instructive to many, who, for the first time, read in their pages of the principles which we desire to impress on the mind of the reader. It is not our intention to make a very extended report this year; but our desire to increase the breeder's faith in pure blood induces us to say a few words concerning the lessons that our recent exhibition was capable of teaching.

One marked feature, distinguishing this from all previous exhibitions, — the absence of mongrels, — encourages the belief that the faith in the old adage that "a hen is a hen" has already given way to the more sensible theory that blood is blood; and we have no fear that they will often, hereafter, appear on a Bristol-county show-ground to have the ugliness exaggerated by comparison with the fine blooded stock of Philander Williams, James Davis, R. G. Buffinton, and others of our first-class poultry-breeders.

The opportunity for an examination of the different breeds presented by our annual exhibitions is one of their chief recommendations.

The last exhibition was very successful in affording to the farmer and others an opportunity to study from living

models some most important principles that must be attended to, if we would succeed as breeders and exhibiters of poultry. As the thousands of visitors passed by the well-arranged coops of Mr. Williams's Asiatics, the common exclamation was, "How beautiful! how beautiful!" Near Mr. Williams's stand, Mr. King and Mr. Dunham exhibited their Black Cochins. How they resemble one another in all the points of excellence! The observer could well understand that a committee must ponder well before deciding which is entitled to the premiums. The resemblance of the fowls exhibited by them, coming from different parts of the county and of different families, convinces us of careful breeding; and we hope they will favor the Society with their fine specimens next year.

Many, through carelessness or some other cause, after they commence with a fine lot of poultry, let them degenerate until they are a disgrace to the name they bear. Now, we will say to them, Procure of some reliable dealer a fine thorough-bred cock; rear your stock from him, and keep the best for breeding-purposes, and in a short time you will have a lot of fowls to be proud of.

That the thorough-bred will mark his offspring (and the more nearly an animal approaches purity, the more it will resemble the thorough-bred parent) is a rule that holds good in breeding animals, and is equally correct in breeding poultry.

The principles in breeding are so very important, that it cannot be too often repeated to those who are ambitious to improve their stock of poultry; and this, we trust, will be our excuse for trying again and again to impress on their minds the fact that the real improvement in our stock will be the result of strict attention to the breeding stock.

Should there be a generous rivalry among the poultry-breeders of Bristol County in improving their stock, coops, and all other things appertaining to the poultry business, this branch of the exhibition next year will be the largest and best ever held on the grounds.

Your Committee would express their pleasure at the increased interest manifested this year by the public for this branch of the exhibition, which promises well for the future.

For the Committee.

J. R. Presho, *Chairman.*

NEW VARIETY OF WINTER APPLES.

[From the Report of the Committee of the Essex Society.]

It seems to your Committee necessary, in making their report, to refer to the report of last year. It was then stated that Mr. Alfred Ordway of Bradford had applied for the Society's premium of a hundred dollars for his new variety of seedling apples. No action was taken by the Committee.

The present Committee, Joseph Howe, John O'Brien, Joshua N. Kent, R. P. Waters, and Aaron Low, met at the Exhibition Hall at Lynn, on the first day of the fair, to view Mr. Ordway's apples, and consider the subject as to their value. The apples are about the size of a medium-sized Baldwin, not quite so red, but a little striped and spotted, like the Gravenstein. They are said to keep as well as, or better than, the Baldwin, and the trees to be good bearers. The Committee thought favorably of them; but not enough was known to justify awarding so large a premium. They therefore concluded to defer the subject until more information could be obtained. In regard to the origin of the apples, it was last year misunderstood. We then stated that the apples grew on a seedling tree in Mr. Ordway's pasture. The fact now appears to be, the apples originated in a neighbor's pasture or wood-lot. Mr. Ordway noticed the fruit, thought it might be valuable, took scions therefrom, and grafted them into two of his own trees, which produced the fruit that has been presented. The owner of the seedling tree, not knowing its value, caused it to be cut with the wood surrounding it.

Another variety of apples was also alluded to in the last year's report, said to have originated by a cross of the Baldwin and Roxbury Russet. As but little was known of its origin, and as some persons doubted the theory of cross-grafting, or, in other words, believed that the fruit of the scion does not in any case partake in any degree of the natural stock, it has, therefore, caused a large amount of discussion.

At a meeting of the Trustees in June last, they requested the Committee to obtain information, so far as possible, as to the origin and value of this (said to be) new variety of fruit, and report thereon. Consequently, your Committee applied for information to individuals, and have received the following from W. H. B. Currier, trustee of the Society from Salisbury, embracing information that he has received from J. H. Hill, trustee from Amesbury, to whom we had previously written. The information seems to be to the point; and the letters contain, as we think, much valuable information.

It appears from the statement that the apples in question are really the Red Russet, and that they originated by a cross of the Baldwin and the Roxbury Russet. The particulars may be had by reading Mr. Currier's letters, which we shall consider part of this report, which are as follows: —

SALISBURY, MASS., July 17, 1880.

To Mr. Jos. Howe.

My Dear Sir, — Yours of the 2d inst. received. I regret that I was not present at the last meeting of the Trustees, although I might not have been able to satisfy the inquiries made concerning the apple you speak of. The whole matter had been talked over with Mr. Hill some months since, who has gathered many facts. Hill visited the farm where Mr. Lucy purchased his apples, and at the time they were stored in the cellar. Hill pronounces them the "Red Russet," and has raised them for several years. They originated on the farm of Aaron Sanborn of Hampton, N.H., who had an orchard of Russet trees; and Mr. Lewis Sanborn grafted them into Baldwins. The number of trees grafted I did not learn; but all the trees so grafted, but one, bore Baldwin apples. From this one graft originated the Red Russet. This was about the year 1810, as near as can be ascertained now. Therefore it was what fruit-men sometimes class as a "sport," — a very unusual thing in fruit-culture, but common among plants, — and from which are obtained many new and choice varieties, to obtain and preserve which requires much care in propagation

The Red Russet is remarkable for its keeping qualities *under certain conditions.* It requires a cool cellar, and the apples must be headed up tight, or they are liable to "shrivel." It is a great bearer and good grower; but I am informed it has one "out:" it bears only every other year.

The gentleman who raised the apple is dead; but the facts were gleaned from his family, who only remember the grafting of the orchard, and its results. One fact I failed to learn, whether all the grafts upon *the one tree* were of this variety, or only *one* or more of them.

I incline to the opinion given by Mr. Hill, who says he has compared the apples raised on the original tree of Mr. Sanborn with those shown by Mr. Lucy.

I am not much posted in fruit-culture; but observation, and some acquaintance with the experiments made by others, confirm the now generally received opinion that the fruit of the scion will partake of the natural stock under some conditions. For illustration: graft a Seckel into a Flemish Beauty, and your Seckel pears will in some instances be so large as to deceive fruit-men, while they will preserve all the rich qualities of the Seckel. So it is that where the original tree is more hardy and vigorous, and bearing larger fruit, than the graft, you may *expect* similar results. It is well known that the best Bartlett pears are grown on grafts put into old-fashioned sweet-pear trees, — the kind that grow little hard pears, and only fit to "preserve." Bartletts grown on such trees will keep better, bear better, and are of sweeter quality. That experiment was tried by a neighbor of mine.

Some years ago I visited Seth Boyden of New Jersey, whose experiments in agriculture and horticulture are as celebrated as his successful experiments in mechanics. He had made "trial grafts," as he called them; that is, had taken three young trees planted for the purpose, — one exceedingly sour, with another less so, and one sweet, — then interlocked them, and grafted the top as if it was one tree. A pleasant sour was the result. Two trees were thus treated, and he found that the graft partook of the qualities of the original stocks. He had trees growing together, in form of a crescent, some in form of a cross, some in the form of a triangle, so grafted.

Very respectfully yours,

W. H. B. Currier.

Amesbury, Mass., July 21, 1880.

Mr. Howe.

Dear Sir, — In the letter written you I was mistaken in one point. The apples purchased by Mr. Lucy were raised in East Salisbury, and, as he stated, near the Seabrook (N.H.) line. They were purchased of Mr. Edward Walton, but nevertheless are Red Russets. They grew on what is considered in that neighborhood *poor land*, — dry, gravelly land, or the local name is, near "Gravelly Ridge." My opinion is (it may not be worth much) that the nature of the soil had much to do with the keeping quality of the apples, and very likely the cellar where they were stored may have been of the proper temperature for the fruit (I believe it is so considered).

This variety of apple is cultivated to some extent in that section of the town, and I find that opinions differ in respect to the quality. Some farmers call them very good; others do not think so well of them.

I should think that a Baldwin apple crossed with a Russet, or any hardier or better keeping variety, would naturally partake of the hardier qualities of the parent-tree. As you suggest in your previous letter, it is a question of great importance; and, while some of our experts in fruit-culture deny it, I think the best class of them admit the fact. It has proved so with pear-culture: I can see no reason why it should not with the apple.

Very respectfully yours,

W. H. B. Currier.

To corroborate the above statements, we would refer to Cole's Fruit-Book, published in 1849. There described as follows: Red Russet, large; flattish round; russet, half covered with red; flesh firm, crispy, juicy; of pleasant, rich flavor; late winter and spring. Great grower and bearer. New and promising. It seems to be a cross between the Baldwin and Roxbury Russet. Origin: farm of Mr. Aaron Sanborn, Hampton Falls, N.H.

Believing as we do, that, if the theory of cross-grafting is correct, much good may result therefrom, and believing in the old saying that experience is the best schoolmaster, we have entered largely into the subject of inquiry of those who have had experience in the cultivation of fruit, particularly those who have grafted trees that were in bearing. We find other cases not very much unlike the origin of the Red Russet.

Some time last winter an article was published in one of the Boston papers, saying there had recently been a meeting of the Massachusetts Horticultural Society in Boston, and the subject of cross-grafting had been discussed for the third time, and that apples had been received from Mr. George F. Eastman of South Hadley, a variety said to have originated by a cross of the Baldwin and Roxbury Russet; and we were informed that they were pronounced at that meeting to be the Red Russet.

We immediately wrote to Mr. Eastman for information on the subject, and soon after received the following reply: His father many years ago planted a nursery, and budded or grafted it with various kinds of fruit. Finding a deficiency of Baldwins, he grafted or budded a portion of the Russets with Baldwins. When the trees commenced bearing, one branch of a Baldwin tree bore Russets: that branch was removed, that the whole tree might be Baldwin. After this branch was removed, another branch, which grew out of the tree directly above that which was removed, and had previously borne Baldwins, produced what is now called Red Russet, — red and rusty, as one would suppose they would be, being a cross of the two kinds. They are said to keep as well as the Russet, and bear every odd year. Mr. Eastman sent us some of the apples, which we carried to the Trustees' meeting in June, and they were pronounced Red Russet.

Another case we will refer to, equally strange as it may seem, but from authority we have no reason to doubt. A tree was grafted near the ground with Baldwin scions. It grew up about four or five feet, then branched out, and among those branches was one of the natural stock. We saw the tree in September last. The natural fruit was a small, sweet Russet, then ripe. The Baldwins were said to be, when ripe, a little rusty, and of mild flavor. Many more instances of like character can be named, and some that seem much more strange; but they are all peculiar cases, and the like cannot be expected again, and are what we call "sport," others call "freaks of nature."

A farmer in Norwalk, Conn., writes in regard to apples, that his experience is, that, to produce perfect fruit, the stock must agree with the scion, and that trees budded in the nursery are liable to bear imperfect fruit. He further says that to graft a *late*-keeping apple into an *early* stock will produce a poor-keeping apple.

We have before us a letter from a gentleman in Westford who has a large orchard. He says, "There is a great difference in the appearance and quality of the same variety of fruit, which, in many instances, I cannot account for by difference of soil, location, or exposure: therefore I think the natural stock must have some influence on the fruit of the scion." The above is a fair representation of a large portion of our fruit-growers. There are, however, many marked cases that have come to our knowledge, some of which we will notice.

Reply of Mr. A.: We had a tree grafted with Baldwins. The stock produced a sweet rusty apple: the produce of the scion was a Baldwin some rusty, the flavor more mild than Baldwins usually are. He further said they grafted scions from a very sour-apple tree into a sweet stock. The fruit it produced was a mild, pleasant apple, much more mild than the fruit of the parent-tree, from which the scion was taken.

Mr. B. grafted Porter scions into an old tree that produced sweet apples, red, and somewhat spotted. The fruit it produced was a mild, pleasant Porter, showing red spots.

Mr. C. grafted Baldwin scions into a tree that produced early apples, and the product decayed early. Another tree

not far distant, which bore late-keeping apples, was grafted with Baldwin, and their product kept well.

Mr. D. grafted, as he says, with scions from a tree that produced a large sweet apple, particularly suited for baking-purposes for family use. The stock produced a small, crabbed sour apple. The product is a medium-sized pleasant sour apple. We visited the tree twice when the apples were in process of ripening, for the express purpose of examining the fruit. When the fruit was fully ripe, it was very pleasant, but could hardly be called sweet. A juicy, good eating apple.

We asked of Mr. G., a man of large experience from a neighboring town, "What is your experience in regard to apples? Does the fruit of the scion partake of the natural stock?" — "I never thought much about it," was the reply. "Is your fruit of the same variety all alike?" — "No," was the reply. "Cannot you think of some case to the point?"— "Yes: we have a Russet tree that bears unusually large apples; but they do not keep well, and we sell them early."— "What was the stock?" — "It produced a large apple that rotted badly." — "What are its surroundings?" we then asked. "A Russet near by that bears that variety like other trees." — "What was the natural stock?"— "I don't know." — "Is the land alike?" — "No difference in the land: there is but one tree between them."

We have much more evidence of like character, which might be presented, but think it unnecessary. All the aforesaid evidence is the result of ordinary grafting, as we have known of no instance where cross-grafting has been performed for the purpose of producing a new variety of fruit.

We do not suppose that by cross-grafting in all cases the varieties will mix, as one can mix molasses and water, or the manufacturer can mix cotton and wool, and always produce a fabric of the same quality. We do, however, believe that the aforesaid statements are true, as we have endeavored to get an unbiassed opinion in all cases; and we think it gives sufficient encouragement to experiment.

Some years ago one of our neighbors visited some of the nurseries in New York. It was in the cold season of the year, when they were engaged in root-grafting. The work of grafting is said to be performed by boys and girls. They dig the roots and cut the scions in the fall, and keep them

moist in the cellar. Process of grafting: Take a small piece of the root about the size of the scion, and splice them together, and tie with a string. In the spring they are planted in the nursery. The reasons for this process are, trees can be produced in less time, and the fruit thought to be more pure, as it partakes less of the natural stock.

We have before us a letter from one of the professors of the Agricultural College at Amherst. He speaks in strong terms of the necessity of increased attention to the cultivation of apples and of new varieties, and suggests the following method of obtaining them, which is by planting seeds from the best specimens of the best variety of apples.

We have given our experience in a previous report on this important subject, and it seems necessary in this connection to publish it again.

Several years ago we planted a nursery, hoping, if possible, to obtain some new variety of valuable fruit. We planted it with nearly all of the seeds of the Baldwin. Before budding, we selected about one hundred of the most thrifty, broad-leaved, promising trees to remain, and come to bearing in their natural state, the most of which were taken up, and planted in another field for an orchard. They all came to bearing. There was not a Baldwin, nor any one that resembled it, among them. All could be improved by being grafted with such varieties as we had. We would now inquire which is the best way of obtaining new varieties of fruit, — whether by planting the seeds of the best specimen of the best variety of apples, or by cross-grafting.

We have been repeatedly told that the subject on which we have been writing belongs to the man of science, to the pomologist, and not to the farmer. Now, we do not undervalue the opinion of the man of science; but we would, with the greatest modesty and candor, submit, who can judge the most correctly, — the man who grafts the tree, who sees and tastes the fruit, or the man of science who never saw the tree, nor tasted its fruit?

In regard to those nameless apples about which there has been so much said, Mr. Currier thinks they are the Red Russet; and that variety, he thinks, is remarkable for its keeping qualities under certain conditions described in his letter.

Would it not be well, therefore, to give it a fair trial on

the conditions described? and is it not possible that it may be of much more value than has been supposed?

We have been informed that the crop of apples the present year is small on those trees that produce those nameless apples; but we hope and expect to hear more about them hereafter.

We think the soil on which apples grow has much to do with the quality of the fruit. A person who has a small orchard which is kept in grass, etc., rich by top-dressing, said to us the other day, Our apples are not nearly as good as those that grow on a certain orchard, that he named. This agrees with the opinion of the writer, that high cultivation is not beneficial to the keeping qualities of the fruit. The fruit will be larger, but not better. Trees that spring up in pastures — if the land is well adapted to fruit, and the trees grafted — will produce fruit of better quality, and that will keep better, than that produced on highly cultivated land.

Mr. Currier also speaks of the importance of a cool cellar, which we approve of. The temperature should be as low as possible without freezing; and to this end the cellar should be made cooler as fast as possible after the apples are put in. We practise as follows: Our cellar is well ventilated with windows and bulkhead doors. We have two bulkhead doors, one of which is wired like the windows. Two thermometers, — one outside, and one inside. When the weather is cooler outside, we open the door and windows; when warmer outside, we shut them: so on from day to day as the weather indicates. This will, to some extent at least, prevent the evil spoken of by Mr. Currier, — the apples shrivelling. Our apples are kept in bins.

We would suggest the method of cross-grafting, which we commenced last spring. We grafted Baldwin scions into a Runnels apple-tree, also some Runnels scions into a Baldwin tree. Next spring we intend to graft from those scions into the same tree or the same variety, and so on from year to year, which we think, before many years, will show the result. We hope others will also try the experiment.

The Society was congratulated at the dinner-table at Lynn for the improvements made in the cultivation of vegetables, and originating new varieties; and we hope the time is not far distant when the Society will be again congratulated, on

the improvement in apples, and in originating new varieties. Let us all do what we can to bring about that result.

In closing, we will say we have no personal interest in the matters, have taken no part in the discussion, have thought but little on the subject, and we now think it strange that we should have spent more than fourscore years on the farm, having been engaged in many experiments and improvements of the day, and have overlooked the important subject under consideration. We have been much more particular in gathering information and writing this report than we should otherwise have been, had we not known that we were treading on disputed ground.

JOSEPH HOWE, *Chairman.*

METHUEN, Nov. 15, 1880.

FINE ARTS.

[From the Report of the Committee of the Worcester North Society.]

Your Committee, in the absence of any implicit instructions, deemed their duties to begin on the day appointed by the printed regulations for the presentation, at the hall, of specimens for exhibition. Accordingly they repaired to their room on Monday, Sept. 27, 1880, received and arranged all specimens of the fine arts presented on that day or the next, and as early as possible on Tuesday, after deciding upon the comparative merits of the exhibited work, affixed the cards indicating the premiums and gratuities. In the task of awarding premiums, the members of the Committee who reside in this county were much aided by the judgment of Mr. Rominer Lovewell, a marine painter of Chelsea, who kindly consented to serve upon the Committee.

The exhibit of this year in our department had the important merit of being, without exception, so far as is known to your Committee, the genuine work of the exhibiters. In consequence, it was not so large as on some former years. Subtract, however, from those former exhibits, that portion of the specimens not executed by the exhibiters, and the exhibit of this year will compare favorably with its predecessors. If the main purpose of the fine-art exhibition is to indicate the state of art-work in this locality, the exhibition of 1880, it would seem, was equally successful with its predecessors. But, as a means of rendering the fair more attractive to its patrons by presenting objects of beauty for their contemplation, it lacked something of complete success. Certainly there would have been an added feature of great interest, if those of our citizens who possess meritorious works of art had loaned them for the occasion. It seems probable that they will not do this without previous earnest solicitation on the part of the Committee, and possibly, also, the expenditure of small amounts for cartage, boxing, and similar expenses. Your Committee would therefore recom-

mend that a strenuous effort be made in advance to secure a loan collection at the next exhibition, and that, if it is thought likely by the Executive Committee that premiums would be a help in that direction, a first and second premium for paintings in oil or water-color not executed by the exhibiter should be offered. The pleasure afforded to the mass of visitors by the sight of the art-treasures accessible ordinarily to but few of them would be well worth the expenditure necessary to secure it.

The specimens of work in oil were, as a whole, marked by an excellent degree of fidelity to nature. The animal-paintings especially were admirable as faithful portraitures of the originals. One visitor at least was heard to recognize upon the canvas the distinguishing features of his four-legged acquaintances. Hardly less real in appearance were some of the flower-pieces. Landscape-painting had less faithful representatives on exhibition, and not without good reason; for although, perhaps, the most commonly attempted, and probably the most attractive to the painter, it is yet the most difficult branch of art in which to attain perfection. Its demands for a thorough knowledge of perspective and a skilful manipulation of colors are imperative. Moreover, the landscape artist must, by minute observation, have gained a deep sympathy with Nature in her varying robes, and then must have a powerful grasp upon the *technique* of his art in order satisfactorily to express on the canvas that which he feels. Few acquire this skill early in life, or in other places than where artists abound. True art demands, like every other mistress, the whole-souled devotion of her lover. In our rural communities and smaller cities, oil-painting yet has ample room in which to grow. With us it is not an avocation, but rather an accomplishment, or the amusement for a leisure-hour. We have, perhaps, reason to be grateful that the perfection of our home talent is not entirely secured: for in that case those whose work we are glad to see in our fine-art room would be spirited away to the large art-centres of our land. We should be content to see our artistic life expanding, to encourage it, and to notice with joy the spread of the love for the beautiful which accompanies its growth.

In water-colors the exhibits were quite numerous, and of

varying degrees of excellence. In some, the conception and execution were very good: where the success was less marked, as in some executed by quite young exhibiters, there was an indication of finer work to come. An effort after truth and honesty, a carefulness to observe fruits and flowers and other objects exactly as they are, and so to represent them, were very evident. The teachers of both oil and water-color painting in our community have reason to be gratified with the success of their pupils. Our young people are getting a facility with the brush, and an interest in art, which would have been a cause for amazement two generations ago.

In crayon-drawing, with the exception of a single piece, the exhibits could not be called satisfactory. Another year it is to be hoped there will be an improvement. Most of the drawings were "copies," and therefore less praiseworthy.

The exhibits in pencil-drawing were all copies. No premium could therefore be given, in view of the principle recommended in the report of the Fine Art Committee of 1879. The present Committee did not, however, follow the suggestion of that report so far as to refuse gratuities to meritorious copies in this or other departments. They were conscious that much patient labor had been expended in this lower grade of work. Just here your Committee would offer a suggestion. In some of these pencil-drawings there was altogether too much work in comparison with the effect produced. No one cares to examine such work with a microscope. The spread of art information so wonderful in modern times — or, perhaps, a change of fashion among artists — has relegated to the past such painstaking fine-point work in drawings designed for wall-exhibitions. A much more pleasing, more artistic effect can be produced in the same composition by the use of charcoal, and in far less time. In fact, the pencil is now employed mainly for mechanical work, and for purposes of instruction, and but little for the construction of finished works of art. The pencil-drawing belongs rather to the school department than to the art-room proper. Your Committee look forward to the time when the premiums now given for pencil-drawings shall be given for charcoal-drawings instead, though our community may not at present be prepared for that step.

The collection of photographs, including photographs finished in crayon, was excellent. Unfortunately there was but one exhibit. It is much to be desired that in future exhibitions there should be a more general response in this department. To that end, it would be well to add to the clause which limits the space of such exhibits to four feet square the qualifying phrase, "unless there shall be ample space unoccupied." The limitation above referred to is known to have kept away from this exhibition one collection of photographs for which there was no lack of room.

Very few mechanical drawings were presented; but those few were of marked excellence. In Fitchburg, where so many such drawings are daily used in the shops, there should be many to compete for this premium.

The school exhibit was this year better than ever before. The numerous designs, ranging through the various grades of schools, were especially ingenious; and those from the higher grades were marked by good taste, careful execution, and a practical aim. This latter feature was demonstrated by articles manufactured from some of them. There were also good representatives of drawing from the cast, and of coloring. It was easy for the observer to discover why Fitchburg was one of the three cities which in common received the highest award at the last annual exhibition of drawings from the various cities of the Commonwealth. That rigid critic of students' work, Walter Smith, principal of the Normal Art School, was one of the number to pronounce these very drawings "excellent." On examination, there was discernible much less difference among the various schools of the same grade than would be expected; but between the works of individual scholars differences were plain. Your Committee notice with regret that no school exhibits from other places than Fitchburg were offered. They are confident that this department of the Society's exhibition is, by its stimulating influence, capable of aiding materially in the improvement of school drawings in other towns. They would therefore suggest that the secretary of the Society, or the chairman of this Committee, be authorized to address within a few weeks a circular to the towns within our district, inviting preparations for a general exhibit of school drawings next year. Since the main motive of our whole art exhibition is edu-

cational, and since industrial art is the most immediately practical of any branch of our exhibition, the encouragement of our school-children to greater efforts in industrial drawing would be exactly consistent with the objects of the Society.

For the Committee.

RAY GREENE HULING, *Chairman.*

REPORT ON NEEDLE-WORK.

[From the Report of the Committee of the Martha's Vineyard Society.]

Perhaps to the greatest number, or to many of the members of the Agricultural Society, the table of needle-work may, at first thought, seem to be of small or no importance, especially so when compared with the fruits of the labor of our husbands and brothers. The nice fat sheep, gentle, sleek cows, noble draught horses and oxen, the well-trained family horses, swift racers, and the nimble apple-pickers are but few of the interesting and attractive exhibitions to be found on our pleasant society grounds.

As we enter the Agricultural Hall we are not surprised that many of our delegates from the State Board have looked with wonder and amazement at the products of our soil, and have given the farmers of Dukes County the credit of exhibiting vegetables of all kinds equal, and many varieties superior, to any displayed in other counties. The island cranberries are far superior to any raised in the State. There were fine apples, luscious peaches and pears, grapes (many varieties) in abundance, — rich, sweet clusters, comparing well, perhaps, with the grapes of Eshcol, — also many other fruits and vegetables too numerous to mention.

While gazing at the abundance of beautiful flowers of rich and varied hues which fill the many vases, and lingering in their delicious perfume, the attention is drawn to the fine display of paintings and drawings, which are well worthy of admiration. The bread, cake, butter, cheese, pickles, and preserves are all tasted, and found good. They are examined and compared, and, by careful decision of competent ladies, the highest prize is awarded to the maker of the best article.

Walk now around the tables of needle-work, the sum and result of the greatest labor and cunning invention. Almost any article that can be named, either useful or ornamental, may there be found, wrought in infancy and old age. A part of an infant's wardrobe was noticed, wrought by a lady over

eighty years of age, and it was very beautiful. There were sofa-pillows, banners, and many other articles, so nicely imitating, that they could scarcely be distinguished from, the real Japanese work; an elegant lace handkerchief, so delicately manufactured that one might imagine it was the work of the cloistered nun, and imported from France. The walls of the hall were tastefully draped with sewed and knitted bedquilts, all of them denoting a degree of patience and skill to which only woman can attain. Some of those quilts are very curious and ingenious in design, as "the Rising Sun," "Log Cabin," "Old Maid's Whim," and "Scotch Plaid." It is all needle-work, and accomplished in the leisure hours, not as labor, but recreation; and, while the busy fingers ply diligently the needle in labors of love and amusement, thought is not idle. How many plans and projects are visioned and invented for the future of the dear little ones while the mother sits sewing and knitting! It requires patience and perseverance to execute an intricate piece of needle-work: therefore it strengthens the patience, and develops the intellect. It prepares the mother to help and encourage the boy to persevere, and, by patience and persistence, to overcome difficulties and hinderances in maturing the plans and bright hopes which she has fondly dreamed during her busy hours.

Needle-work includes the old-time knitting-needles, which, with their music, give us the good "blue-mixed" yarn stocking, and the nice warm mittens, with which no modern invention can compete. The crochet-needle, with its rich and gorgeous-colored worsteds, is an industry fascinating and profitable, well worthy of encouragement. On the table could be seen specimens of the worsted-work, — socks, hoods, and shawls. Those articles are manufactured by very many of the young ladies in the county, and it is a source of considerable revenue. One agent residing in Boston has paid for worsted-work in Edgartown, in the last fifteen years, over fifty thousand dollars, aside from the money paid by other agents there. How much has been paid in other towns in the county, I am unable to state.

In most of our large cities may now be found a decorative art society; and conspicuous in its exhibitions may be seen specimens of porcelain and china painted by hand, also

many beautiful pieces of artistic needle-work. Needle-work is now receiving much attention in plain and useful branches equally with the ornamental.

There is at this day a peculiar charm and attraction in every event that pertains to the customs and amusements of our forefathers. Needle-work is an art of great antiquity. It originated in Eden. Modern industry has done very little, either by discovering new materials, or inventing new modes of manufacture. Embroidered linen, exquisite specimens of muslin enriched with needle-work in gold and silver floss, appliqué-work and silk embroidery, might have been termed art needle-work in the days of the ancient Israelites. At that period, we read that wise-hearted men and women wrought the work of the sanctuary so earnestly and generously that they required restraint: they had brought sufficient, and too much. The hangings for the tabernacle door were wrought with blue, purple, scarlet, and fine twined linen. Artisans, engravers, and cunning workmen did not hesitate to acquire, also, the art of embroidery in its variety of rich and gorgeous colors, with which the people richly decorated their altars and places of worship. Articles of dress were not neglected. Coats of fine linen, girdles of needle-work, bonnets, and numerous other articles were exhibited. Needle-work is an art useful and interesting. It is easily acquired, and, as a source of profit or amusement, may be practised by all classes. It was formerly the custom in royal families to devote certain hours to needle-work. The queen, with her maidens around her, sat embroidering at their frames of tapestry, and also performed other varieties of needle-work for ornament and utility. Penelope gives us an interesting example of the influence of industry and ingenuity. While industriously employing herself on the world-renowned "web," of which she designed to make a funeral ornament for the aged Laertes, the father of Ulysses, she consoled herself for the long absence of her husband, and solaced her grief, by her constant labor on this tribute of love, and during her labors devised the means of escape from the importunities of her numerous suitors.

For the Committee.

MRS. J. PIERCE.

FLORAL DEPARTMENT.

[From the Report of the Committee of the Hoosac-Valley Society.]

To the Hoosac-Valley Agricultural Society the Committee on the Floral Department at the exhibition of 1880 have the honor to present the following report: —

The Society and the exhibiters in this department are entitled to most hearty congratulations. The variety, selections, and condition of plants and flowers on exhibition, evince a refinement of taste, skill in cultivation, and progress in the art, gratifying in the present, and replete with promise for the future.

But your Committee are profoundly impressed with the sentiment that this department is worthy of far more attention than it has hitherto received.

The progress and revelations of floral science during the past half-century; its exact classifications, evincing the perfect harmony of infinite variety with one grand law of the floral world; its vital connection with all upon which animal life subsists; its influence upon the atmosphere we breathe; its contributions to the food we consume; its position as the grand ornamental system of the earth, embellishing our homes, our gardens, our fields, and our forests; and its silent and marvellous power in the education, cultivation, and refinement of the mind, — give it a place scarcely second in importance to any in the industries and studies of the people.

The Creator has, indeed, made nothing in vain; but he has, in an important sense, given to flowers the crowning position among his works. This superiority is seen in the harmonious blending of beauty, fragrance, and utility. What a sombre, gloomy world this would be without flowers, or if all flowers had been made uniform in size, form, and color!

Admiration of the beautiful is a God-given instinct, universal in intelligent beings; and God has adapted the flora

of the world to its gratification. Flowers are almost the first objects that excite the admiration of the infant; and this sentiment abates not through all the stages of life and amidst all its cares, perplexities, and sufferings, and finally lays the choicest floral tribute upon the casket of the dead as the most appropriate substitute for the departed spirit. This sentiment is apparent, not alone among the civilized and cultivated, — in their conservatories, their boudoirs, their gardens, or their tables, on their persons, in their sick-rooms and nurseries, in their churches everywhere, — but it is the inspiration of the wild savage of the forest, the besotted Caffre, the superstitious Hindoo, and the stupid Greenlander. Everywhere the lowest order of intelligence, as well as the highest, appreciates this loving gift of a Father's hand.

To meet this demand, we find the marvellous variety, not only in form, size, and tint, adapted to the corresponding diversity of tastes and to the changes through which taste passes by cultivation, but similar variety defined by the various mental constitutions and habits of different nations and communities.

And what contributes largely to this wonderful supply, and insures perpetual novelty, is the ability to propagate endless variety by cultivation. We must not dwell upon this feature of the floral kingdom.

We commiserate the man or woman who can walk the green earth, uninspired by the beauty with which a loving Father has so profusely adorned the pathway on every side. We see not how such can appreciate the floral beauty of paradise, so vividly pictured by the Revelation.

In the most delightful harmony with the beautiful, the fragrance of the floral kingdom is scarcely less prolific of pleasure to the sense of smell. Indeed, it is difficult to tell which possesses the greater power of inspiration, which most to admire, — the delicate tints which adorn the trailing-arbutus and tiny violet, or the sweet odors they exhale. Both combine to inspire the delightful anticipations of the blooming and fruitful season of which they are the harbingers. Every fibre of our being is thrilled with exquisite emotion when we walk in the solitude of the forests, with the canopy of fresh verdure above and around us, and the

air laden with the mingled odors of varied tree and shrub and vine new and sweet from the birth of spring. What an ethereal buoyancy is inspired by the blooming orchards and fields of clover! What new sentiments of domestic bliss are awakened when welcomed home by the perfume of sweet-scented flowers! How greatly enhanced the pleasure of a journey when the air is redolent from the gardens and fields and forests! When we stand amidst the glories of the florist's conservatories and gardens, we marvel not that God prepared so beautiful an abode for the home of innocence.

But flowers are not simply ornamental: their utility is equally apparent. It is doubtful if even the researches of the botanist have yet discovered a tithe of the useful purposes they serve. As indications of the nature, quantity, and perfection of the coming fruit, as a medium through which varieties of fruit are multiplied and perfected, as indices to noxious and harmless plants, as antidotes to noxious vapors and disagreeable odors, they are priceless.

Their contributions to the healing art are many, increasing and invaluable. They are the repositories of the honey that fills our hives, and from them the busy bee manufactures the delicate wax which contributes so largely to the production of articles of ornament and utility. From them are extracted largely the perfumes of commerce. They furnish models for the artist and the milliner.

And then what a teacher is the floral kingdom! Jesus, the divine teacher, himself the Rose of Sharon, made the lily-of-the-valley immortal, as the type of humility, dependence, and moral loveliness. A conservatory is a picture of human life. It teaches of birth, growth, maturity, old age, decay, and death, — ay, of the great resurrection, and our dependence upon the great Florist above for the varieties of mental endowment.

In it we find a type of all the personal, social, and moral virtues, and of the varied styles of mental and moral beauty with which man is endowed. Indeed, we may esteem the race as a flower-garden, and give them corresponding names. We find among mankind the modest violet, the gay pansy, the blushing rose, the pretentious hollyhock, the ambitious magnolia, the conceited coxcomb, the sturdy oak, the cling-

ing vine, the delicate sensitive-plant, the refined and fragrant mignonette, and the vulgar bouncing-bess.

Thomas Moore caught the spirit of these lessons when he indited the following lines on the farewells of friendship: —

> "Long, long be my heart with such memories filled,
> Like the vase in which roses have once been distilled:
> You may break, you may shatter, the vase, if you will;
> But the scent of the roses will hang round it still."

And then in this estimate we should not overlook the silent, unconscious, moulding influence of flowers in the formation of character, — the chastening of all that is crude in our natures, and the refining and beautifying of all that is lovely. Especially is this observable in children. No one can look upon a collection of flowers and not receive in some degree a refining and elevating influence. They rebuke all coarseness; they shame impurity; they reprove filthy habits; they invite all beholders to a life of purity, chasity, refinement, usefulness, and piety. They hold an important commission in developing all that is pure and good and great in a true and noble manhood and womanhood, and in transforming the homes of the people into happy types of the lost Eden.

A wealthy gentleman residing in the midst of a sterile region and thriftless population in New Hampshire invested money at a great annual sacrifice in a magnificent flower-garden expressly for the general improvement of his fellow-townsmen. He made them welcome to plants and slips and seeds; and in a few years his most sanguine hopes were realized in seeing most of the homes in town adorned with well-kept flower-gardens, and a marked improvement in personal appearance and manners, and in the tidiness and thrift everywhere apparent. Well for the world if it were blessed with more such missionaries!

These thoughts are submitted with the design, if possible, of awakening a deeper interest in the floral department of your annual exhibitions.

STEPHEN G. ABBOTT,
MRS. GEO. DEAN,
MISS LOIS DEAN,
Committee.

STATEMENTS ON CORN.

CORN GROWN BY E. C. PARKER, SOUTH AMHERST.

[From Report of Hampshire Society.]

The soil on which I raised my acre of corn was a sandy loam, which grew a crop of corn in 1878 and a crop of rye in 1879, without manure. The land was ploughed in the spring to a depth of eight inches, and harrowed twice. The manure was stable manure (twenty-two loads of thirty bushels each) spread on and ploughed under, and a handful of ashes and hen-manure, to the hill. The corn was planted in hills three by three feet, by hand, on the 21st and 22d of May, and was the "Parker twelve-rowed variety." Cultivated and hoed twice. Commenced cutting Sept. 7; cut close to the ground, and set it up thirty hills to the stook, tying the top. Husked in the field, or made into bundles and carted to the barn to husk. The yield was determined by measuring four average rods in different parts of the field, and computing the result from the average weight of corn on each. The amount of fodder was estimated by weighing that grown on the before-mentioned four rods. I also took one hill of four ears, and shelled and weighed the corn, which was a pound and a half: the result computed from this would give a yield of $129\frac{3}{4}$ bushels; the result from measurement of the four rods gave $113\frac{22}{56}$ bushels, which result I have adopted. Considering one-half of the manure still in the land, the account will stand about as follows:—

Dr.

Ploughing, harrowing, and furrowing	$3 00	
Manure, half of twenty-two loads of thirty bushels	15 00	
Seed and planting	2 00	
Hoeing and cultivating	2 80	
Harvesting and husking	7 20	
		$30 00

Cr.

$113\frac{52}{56}$ bushels corn at sixty-five cents	$73 81	
4,480 pounds fodder at eight dollars per ton . . .	17 92	
		$91 73
Profit of one acre		$61 73

E. C. Parker.

South Amherst, Nov. 18, 1880.

CORN RAISED BY H. C. WEST, HADLEY.

The field of corn I present for premium contains five acres. It was cleared twenty-three years ago of a heavy growth of hard and white pine and white oak timber, sowed to wheat the next fall, and pastured since with sheep and cattle. Ploughed early in the spring, and planted from the 20th of May to the 2d of June with three dollars' worth of fertilizers per acre in the hill, — one acre with phosphate, three with fish and potash, and one with chemicals, — all of as near the same value as possible without any perceptible difference in the yield of corn. It was cut up the second week in September. The amount of corn was determined as follows: Two rods were selected and measured, as near an average as possible; and, the last of August, the corn was topped, and allowed to stand until Oct. 26, when it was picked and husked. Weighed the same day eighty-three pounds, allowing seventy pounds to the bushel, which gives ninety-four bushels and sixty pounds per acre. The corn was shelled Nov. 1, and the corn and cob weighed again, giving fourteen pounds and three-fourths of cob, and sixty-five pounds and one-fourth of corn. A stricken bushel weighed fifty-six pounds and a half, making ninety-three bushels and twelve pounds per acre.

The corn was planted with sixteen hills to the rod, making thirty-two hills on the two rods measured. Whole number of ears, 253; to each hill, $7\frac{1}{36}$. Largest number in one hill, nine; smallest number, two, — on one stalk. Allowing the fodder for husking, and no rent for the land, as it is worth more than when I commenced, the account will stand about as follows: —

Dr.		
Cost of labor up to planting	$65 00	
Cost of labor up to time of husking	62 50	
Fertilizers	15 00	
		$142 50
Cr.		
466 bushels of corn at thirty-one cents		144 46

HADLEY, Nov. 12, 1880. H. C. WEST.

CORN GROWN BY TIMOTHY PUTNAM, LEVERETT.

The corn we entered was in two pieces. The first contained one acre, and was planted with corn last year, producing a good crop. This year it was manured with ten two-horse loads of good compost spread on and harrowed in. Planted May 15, with a "Woodward" planter, in drills, and thinned to four stalks to three feet and one-half. It was cultivated three times, and hoed twice. It produced, as near as we could estimate, 6,027 pounds, which, reckoning seventy pounds to the bushel, gives eighty-six bushels. The other piece, containing one acre and fifty rods, was turf; mowed twice last year, ploughed in the spring, and treated the same as the other piece; produced 9,163 pounds, or 130 bushels. Considering the improvement of the land as equal to interest and taxes, the account for the two acres and fifty rods is as follows: —

Dr.		
Ploughing and harrowing	$8 00	
Eight and a half cords manure, and carting . .	56 00	
Hoeing and cultivating	8 00	
Harvesting and husking	16 35	
		$88 35
Cr.		
216 bushels of corn at seventy cents	$151 20	
Fodder, six and a half tons at six dollars . . .	39 00	
		190 20

Balance in favor of the crop, $101.85; or the corn reckoned at cost would be twenty-seven cents per bushel.

LEVERETT, Nov. 20, 1880. TIMOTHY PUTNAM.

CORN RAISED BY AUSTIN EASTMAN, NORTH AMHERST.

The land on which the corn grew was a stiff, loamy, gravelly soil. It measured three hundred rods, and had been

mowed several years without top-dressing. Manure was harrowed in, and the fertilizer put in the hill. Yield, sixty-eight bushels per acre.

Cr.

127 bushels at sixty cents	$76 20	
Corn-fodder	24 00	
		$100 20

Dr.

Ploughing	$3 00	
Carting manure	3 00	
Harrowing	1 50	
Planting	2 50	
Hoeing	9 00	
Cutting and stooking	3 00	
Husking	6 35	
Manure	22 00	
Stockbridge fertilizer	13 50	
		63 35
Net profit		$36 85

AUSTIN EASTMAN.

NORTH AMHERST, Nov. 15, 1880.

CORN RAISED BY GEORGE L. COOLEY, SUNDERLAND.

The land on which the corn grew was a peat or muck meadow that had been drained by surface ditches, and also improved by carting on to it in former years considerable loam and sand. I value the land at a hundred dollars per acre. The land had been down to grass for six or eight years previous, being top-dressed with barnyard manure two or three times. The land was ploughed partly in the fall of 1879, and the remainder in the spring of 1880, with no apparent difference in the crop. The depth of furrow was from four to seven inches, or about six inches average depth. The piece was manured with twelve two-horse loads of manure, sledded out the previous winter, and left in piles: these were forked over once before using, and covered with dirt scraped up about the pile. No other fertilizer was used. May 17 the soil was pulverized thoroughly with a wheel-harrow, occupying the team four hours. The field was rowed both ways with a furrowing plough: time used in furrowing, three hours and one-half for man and horse. Putting out manure in the hill, one man with horse ten hours; amount used in each hill, a medium shovelful.

Time used in planting, one man fourteen hours. Commenced hoeing June 11. Labor, first hoeing, one man six hours; cultivating, two hours and one-half. Second hoeing, July 9, one man ten hours; cultivating, three hours and one-half. No other labor was expended on this piece of corn till cutting in September; and, as I frequently let out corn to cut and husk for the fodder, I made no further account of labor. Care was taken to have the stooks of uniform size, — each to contain eight bundles. The piece was measured by a surveyor before and after cutting and setting up, and contained a hundred and ten stooks. In October, ten of these stooks were taken in different parts of the field to get a fair average, and the product kept separate when husked, and spread in a chamber to dry. The ten stooks yielded nearly fourteen baskets of corn, which, shelled Nov. 20, yielded just seven bushels by measure, and the same by weight, calling fifty-six pounds a bushel. This result multiplied by eleven gives seventy-seven bushels of shelled corn to the acre.

The estimated cost of labor up to harvesting is as follows: —

Dr.		
Ploughing	$2 00	
Hauling manure	2 00	
Harrowing	1 20	
Furrowing out	75	
Putting out manure	2 25	
Planting	2 10	
Cultivating for first hoeing	56	
First hoeing	90	
Cultivating for second hoeing	78	
Second hoeing	1 50	
Total for labor	$14 04	
Value of manure, eighteen dollars. Calling one-half left in the land, we charge the crop	9 00	
		$23 04
Cr.		
Value of seventy-seven bushels of corn at sixty-five cents		50 05
Profit		$27 01

Now we deduct six dollars for interest, and one dollar and forty cents for taxes, and we still have a profit of $19.61.

George L. Cooley.

Sunderland, Nov. 20, 1880.

CORN GROWN BY H. C. COMINS, HADLEY.

The field of corn which I entered measured seven acres, the soil being gravelly loam. It was sod-land, part of which produced a light crop of hay last year, which was not worth cutting. All the labor was done with a team, except applying fertilizers and planting: indeed, not a hoe touched the piece after planting. The items of cutting, stacking, and husking, which appear in the account, may seem too low; but the work was jobbed at those figures. The corn was measured in two baskets, and quite a number weighed, taking the average, and allowing seventy-five pounds for a bushel of corn. The grain was very dry, with no soft corn, and the fertilizer was Stockbridge corn-fertilizer. The field was rented, as appears below. My object in entering this field was not to see how large a yield I could get, but how cheap I could raise corn. The account stands as follows: —

Dr.

Rent of land	$18 00	
Ploughing	14 00	
Work with "Randall harrow"	4 00	
Harrowing with seed-harrow	4 00	
Marking both ways	2 50	
Furrowing one way	2 50	
Cost of fertilizer	58 50	
Applying fertilizer, and planting	6 00	
Cultivating twice, once each way	5 00	
Hoeing with "Prout's horse-hoe"	4 00	
Cutting and stooking	10 00	
Husking	22 00	
Carting corn and fodder	20 00	
		$170 50

Cr.

439 bushels of corn at seventy cents	$307 30	
14 tons of fodder at six dollars	84 00	
		391 30
Net profit		$210 80

H. C. Comins.

Hadley, Nov. 10, 1880.

CORN RAISED BY W. A. WILSON, NORTH HADLEY.

The land measured five acres, and is valued at fifteen dollars per acre. Improvement of land pays rent and taxes. Stover pays harvesting and husking.

Dr.

Ploughing and harrowing	$11 25	
Furrowing and planting	2 50	
Stockbridge fertilizer	45 00	
Hoeing and cultivating once	8 50	
		$67 25
Cost per acre		13 45

Cr.

376 baskets, forty pounds per basket, or 15,040 pounds, which, reckoning seventy pounds per bushel, would make 214 bushels of sixty pounds at sixty cents	$128 91
Or, per acre	25 78

W. A. Wilson.

North Hadley, Nov. 18, 1880.

CORN-CROP STATEMENT OF JOB R. SMITH.

[Deerfield-Valley Society.]

The amount of land in corn, one acre, having a soil of sandy loam, and inclining a little to the south and east. Value of land per acre, fifty dollars. Grass was cut on the piece for seven years previous to the present crop, with no applications of fertilizers for the grass-crops in any form.

April 29, 1880, I ploughed the above-stated piece of land, but once ploughed, about five inches in depth. May 8, 1880, I harrowed the piece thoroughly with rotating harrow. Marked the piece into rows, running north and south, three feet and four inches apart. April 29, 1880, at time of ploughing the land, or before ploughing, I spread on the sward thirty loads of vault-manure made from my dairy of cows; and at time of planting the corn, May 10 and 11, which was the variety known as the Holden corn, planted dry, I put the hills three feet apart, putting five kernels in each hill.

The manner of planting was as follows: I first put a tablespoonful of special fertilizer in each hill, covering it with a hoeful of soil; then pressed the same with my foot, making a suitable place for the seed, which was dropped, and covered with about two inches of fresh soil.

The special fertilizer used was the superphosphate manufactured by the Quinnipiac Fertilizer Company of New London, Conn. I used three hundredweight of said phosphate on this piece.

The crop was cultivated twice, and hoed three times. First time of hoeing was May 28, 1880; second time, cultivating and hoeing, was June 10 and 11, 1880; third, cutting weeds late, was July 19, 1880. My cultivation was "hill."

The corn was cut up at the roots Sept. 3, and stooked with twelve hills of corn in each stook. I commenced husking the corn Sept. 13, and finished Sept. 28, first drawing the corn into the barn.

The corn was put into an open bin or crib immediately after husking, and all shelled and weighed in December, excepting ten bushels, which was shelled and weighed the very last days of November. I finished shelling and weighing the corn Dec. 27, 1880; and the amount of shelled corn on the piece was 4,489 pounds, or eighty bushels and nine pounds. Also I had five bushels of No. 2 corn, or soft corn.

The merchantable stalks weighed, by estimation, 3 tons and 1,280 pounds. The estimation is based upon the following facts: viz., one stook weighed 20 pounds, after curing three weeks without any rainfall upon it. There were 14 rows of stooks with 26 stooks in each row, making 364 stooks on the piece. Weight of 364 stooks at 20 pounds each, equal 7,280 pounds, or 3 tons and 1,280 pounds.

I have been offered eighty cents per bushel for my No. 1 corn, therefore consider that price the market-value. This offer was made Dec. 21. I give myself credit for the following amounts: —

Cr.

80 bushels and 9 pounds corn at eighty cents . . .	$64 12	
5 bushels No. 2 corn at forty cents	2 00	
7,280 pounds stalks at eight dollars per ton . . .	29 12	
		$95 24

Dr.

30 loads of manure at one dollar	$30 00
3 hundredweight phosphate at two dollars and ten cents,	6 30
Drawing out manure, and spreading same	3 50
Ploughing land (one man and team one-half day) .	1 50
Harrowing (one man and eleven horses one-half day) .	1 00
Planting corn (one man two days at one dollar) . .	2 00

First time hoeing and cultivating	$2 50	
Second time hoeing and cultivating	2 50	
Third time hoeing (one hand one day)	1 00	
Seed-corn, eight quarts at one dollar per bushel . .	25	
Cutting and harvesting corn	9 00	
Total cost of crop as per schedule		$59 55
		$35 69

The weather was warm and dry, with an occasional shower of rain.

I have used the "Holden corn" for two years as my main crop of corn. At second hoeing I thinned the stand to four stalks in each hill. A very large proportion of the stalks have two ears of corn on each. I found by experiment that this corn yielded a very small per cent of cob. I took two bushels of ears of corn, and the weight of the two bushels was eighty pounds. I shelled the same, and got of corn sixty-eight pounds, leaving only, in weight of cob for two bushels of ears, twelve pounds, or six pounds to the bushel of ears. This is why I like the Holden corn. I prefer to raise corn rather than cob.

In summing up the expenses of this crop of corn, I find a total debt of $59.55; add to this the interest on the value of the land (say $50), or $3, and we have a total cost of $62.55. Comparing the value of crop, etc., I find I have in value $95.24; add to this one-third of the value of the manure left in soil, or $10, and I have a credit of $105.24. Balance in favor of crop, $42.69. Cost of raising this corn per bushel, twenty-eight cents and small fraction.

JOB R. SMITH.

COLERAINE, Dec. 28, 1880.

FRANKLIN-COUNTY SOCIETY.

CORN.

[Statement of George E. Taylor.]

I came into possession of the farm where I now live in 1860. The meadow, a fine loam resting on gravel and clay, had never been ploughed but once. Part had been planted with corn, with poor success; the remainder was broken when I took possession. It was laid down to grass as soon as convenient, all of it (three to four acres) producing heavy grass, but not considered adapted to corn: then followed occasionally a top-dressing; but the crop diminished so much, that I determined to try the plough. In September of 1877 I turned over one acre of this meadow. In May of 1878 spread on some twenty loads of stable manure, and harrowed; then furrowed three feet and a half apart, and dropped seven loads of compost in the hill three feet apart; hoed; cleaned. Notwithstanding frosts, early and late, together with tempest of wind and rain, we harvested eighty bushels of corn, with extra crops succeeding years. In October of 1879 turned over a hundred and seventy rods treated in the same manner, the tornado of July 12 breaking one-third of the stalks; yet we gathered about ninety bushels of corn. In November of 1879 turned over the remainder of this meadow, planting a hundred and eighty rods to corn, with the following treatment: twenty-five loads of stable manure spread on in May, and harrowed with Randall's wheel-harrow; furrowed three feet and a half apart, five or six inches deep; then dropped, in hills three feet apart, seven loads of compost composed of swamp-muck and horse-manure worked up by hogs; on this was dropped a hundred pounds of plaster; covered; and the corn planted two inches deep May 18. The corn came up quickly, grew very fast, with a dark-green color, and standing five stalks in the hill, which at second hoeing (June 16) was thinned to four stalks in the hill. June 1, 16, and

July 13, the cultivator was run between the rows, and was followed by the hoe, thoroughly cleaning the weeds. From June 12 to July 3, the weather was exceedingly dry; and a portion of the field suffered for rain, also causing it to rust, which hindered the growth of ears. Sept. 1 cut in stacks of fifteen hills, each about four hundred stacks, which weighed thirteen pounds and a half per stack when thoroughly dry, and separated from the grain; being five thousand four hundred pounds of stalks. The grain in the ear was measured at the rate of seventy pounds per bushel at husking, being eighty-nine baskets. There were also four hundred pounds husks.

The next piece to which I call your attention, a hundred and sixty-five rods, was, in 1860, in a reduced condition, consisting of upland loam. This is the third time I have planted it in twenty years. It was laid down to grass in 1874. In 1879 planted one half-acre to potatoes, using six loads stable manure in the hill: a poor crop of potatoes was the result. In May last (the 8th) ploughed the potato-ground, and sufficient grass-ground to make a hundred and sixty-five rods, turning under twenty loads of calf and horse manure, — eight of the former, and twelve of the latter; furrowed in rows three feet and a half apart; and dropped a compost of swamp-muck, horse-manure, hen-manure, and night-soil, to the amount of four loads in the hill, three feet apart; covering, and planting two inches deep, May 20, using five kernels in each hill. Came up even, of a dark color, and grew well. Ran the cultivator between the rows June 3, 17, and July 13, following with hoe; hilled very little last times; cut, Sept. 9, in three hundred stacks, weighing, when dry, exclusive of grain, forty-five hundred pounds. The corn, yielding ninety bushels of seventy pounds each, was shelled the present month (December), and produced, when weighed, 82$\frac{33}{56}$ bushels, a shrinkage of 7$\frac{23}{56}$ bushels from husking; seven hundred pounds of ears yielding five hundred and eighty-three pounds and a half grain, and a hundred and sixteen pounds and a half cobs, or eleven pounds cobs to fifty-six pounds grain.

George E. Taylor.

Shelburne, Dec. 29, 1880.

FRANKLIN COUNTY.

Pursuant to a request from the State Board of Agriculture, the Franklin-county Agricultural Society offered, from the money received from the State, two premiums of thirty dollars each for the best crop of Indian-corn and for the best crop of potatoes grown in 1880, with a statement answering the questions given below.

George E. Taylor of Shelburne received the premium on corn; and E. L. Delano of Sunderland, that for potatoes.

In addition to these were some statements of unsuccessful competitors, which for clearness in detail, and as showing that this most valuable grain can be raised here in Massachusetts at a much less cost than we have to pay for Western corn on the cars, are well worth reading.

More than that, they show a net profit, on each acre, of from thirty to forty dollars, and the land in prime condition for the next crop.

Fred L. Whitmore of Sunderland made the following clear and comprehensive statement concerning his field of five acres of eight-rowed corn, a most beautiful specimen-trace of which was exhibited: —

Dr.		
Ploughing in fall	$10 00	
1,000 pounds muriate of potash	22 50	
2,500 pounds dry-ground fish	50 00	
Applying fertilizer, and harrowing	5 00	
Planting May 12, and seed	3 50	
Horse-hoeing three times at two dollars and a half	7 50	
Hand-hoeing	7 50	
Cutting Sept. 13–17	10 00	
Husking at two cents and a half a bushel	20 00	
Carting fodder	14 00	
Interest and taxes	25 00	
		$175 00
Cr.		
400 bushels corn at seventy-five cents	$300 00	
12½ tons of fodder at six dollars	75 00	
		375 00
Net profit		$200 00

Net profit per acre	$40 00
Cost per bushel	25
Cost per acre for fertilizer	14 50
Cost per bushel for fertilizer	18
Cost per acre for labor	20 50
Cost per bushel for labor, about	07

The corn weighed sixty pounds to a bushel, and the proportion of corn to cob was as eighty-four to one hundred. The weight of ears required for a bushel was sixty-six pounds and two-thirds.

Attached to this was the following statement of the cost of raising corn in Valley, Neb. It is from the Whitmore Brothers. The amount of land considered is an acre, worth twelve dollars and a half.

Dr.

Interest at eight per cent	$1 00	
Taxes	10	
Ploughing	1 00	
Harrowing	50	
Planting	25	
Seed	05	
Cultivating three times	90	
Husking at three cents and a half per bushel	3 85	
		$7 65

Cr.

110 bushels at twenty-three cents per bushel	$25 30	
Fodder	1 00	
		26 30
Net profit		$18 65

The cost of the corn was a trifle less than seven cents per bushel; 2,722 hills were planted to the acre.

It is curious to notice that the cost of the Nebraska corn was a little more than one-third of the Franklin-county corn, and the price a little less than one-third, showing the Franklin-county corn the more profitable.

F. H. Williams of Sunderland gave a statement concerning his field entered for the special premium. It contained a hundred and sixty-one rods of land bordering on the Connecticut; was in grass in 1878, and corn in 1879; manured with twenty-one one-horse loads of stable manure spread evenly; planted, four by three feet apart, the eight-rowed

Massachusetts white corn, and thinned to three stalks in hill; applied ten bushels of ashes just before the corn came up; cultivated twice; topped three-fourths of it as an experiment, but did not see as it made any difference in the soundness of the corn, as he had no soft corn on either portion; shelled in four hours by putting on barn-floor, and riding horses over it; fanned and weighed. Result, 6,141 pounds of clean corn, or 109 bushels 37 pounds; had 6,000 pounds of fodder, and 1,104 of cobs; corn weighed fifty-eight pounds to bushel, and at Mr. W.'s rates of reckoning labor, fertilizer, etc., cost thirty-five cents per bushel.

Charles Williams of Deerfield harvested 399 bushels of corn, worth seventy cents a bushel ($279.30), from seven acres; the whole cost of cultivation, etc., being $160.17. The fodder weighed 19,370 pounds, which, at five dollars a ton, was worth $48.20; the husks sold brought $15.78, which made the total income of the seven acres $343.28: this sum, minus the cost ($160.17), leaves a net income of $183.11. The crop yielded fifty-seven bushels to the acre, and its cost was twenty-four cents and one-tenth per bushel.

T. J. Field of Northfield gave a statement of his field of twelve acres and a half of Early Dent corn, which took the second premium at the three-counties fair at Northampton. The soil was a not heavy clay loam; and in 1878–79 the crop was grass, and no manure was used. Ploughed in May about six inches deep, after which the manure was drawn, spread, covered with a wheel-harrow, and then cultivated with a Thomas harrow. The following is the debtor side of the account: —

Ploughing six days and a half at three dollars	$19 50	
Harrowing and cultivating five days	15 00	
Manure (one-half charged to corn-crop)	250 00	
Hauling manure fourteen days	42 00	
2½ bushels of seed	5 00	
Planting two days, with horse	4 00	
Cultivating three times	15 00	
Hand-hoeing eight days	8 00	
Cutting and stooking sixteen days	16 00	
Husking at four cents per basket	60 80	
Drawing fodder to barn	12 00	
		$447 30

There were harvested 1,520 baskets, which weighed on

the cob 72,960 pounds. The shelled corn weighed 60,800 pounds, which, at fifty-six pounds to a bushel, makes 1,085 bushels and forty pounds, or eighty-six bushels and a half, per acre. There were also upwards of twenty tons of fodder. Taking out its value at eight dollars per ton, the cost per bushel of the corn was twenty-five cents and a third.

Job R. Smith of Coleraine raised an acre of Holden corn, planting three feet four inches by three feet apart, using three hundred pounds of Quinnipiac fertilizer: four stalks were left in a hill; harvested three hundred and sixty-four stooks weighing twenty pounds each, which gave 7,280 pounds of fodder. Corn weighed 4,489 pounds, or eighty bushels and nine pounds. There were also five bushels of soft corn. Deducting whole cost, including interest, and taxes on land, from the value of crop, and making allowance for value of the fodder, the corn cost twenty-eight cents a bushel. No extra labor was put upon the piece. Farmers should raise rather than buy: they can raise an extra acre each year.

R. N. Oakman of Montague took five acres on Montague Plain. Ploughing cost five dollars; harrowing, a dollar and a quarter; guano, twenty-one dollars; plaster and seed, three dollars; planting, six dollars; hoeing twice, four dollars and three-quarters; cutting and stooking, six dollars and a quarter; husking, six dollars and a half; interest and taxes, seven dollars and a quarter: total for the five acres, seventy-one dollars and a half. Harvested six tons, worth seven dollars a ton (forty-two dollars), which leaves cost of corn twenty-nine dollars and a half. As a hundred and thirty-eight bushels (shelled) were harvested, the cost was twenty-one cents and a half a bushel. In making the above calculations, three dollars were allowed per day for man and team, a dollar and a quarter for a man alone, and seventy-five cents for a boy.

Mr. Oakman's second set of figures were concerning a field of eight acres of river-land. The land in question has had no manure put on it for over twenty years, and has raised corn every third year. The corn is fertilized by ploughing under a second crop of clover. The land seems as good as it was a score of years ago: at any rate, it produces good crops. The past year the corn he raised there cost twenty cents per bushel.

REPORT OF EXPERIMENTS IN THE CULTURE OF POTATOES.

The following is the statement made by Jesse L. Delano of Sunderland concerning the acre of potatoes he entered for the special premium offered by the Franklin-county Agricultural Society for the best conducted experiment in potato-culture. This was the acre that received the premium; and the statement is worthy the attention of every farmer.

Having been engaged in the raising of potatoes in a small way for several years, and observing various phenomena in their growth, I became somewhat anxious to learn the best manner of performing the various operations of preparing the seed and cultivating the plants. On the latter point, I found that the general custom of farmers and reports coincided with my experience and practice, and that early planting, clean culture, moderate hilling, and keeping off the potato-bugs, was universally deemed to be important and essential. But on preparing the seed — which to me seemed to be a most important subject — hardly any two farmers agreed. Some said that whole potatoes should be used: some, that they should be cut in two pieces; some advocated one eye; some, two eyes; and some insisted that too much seed was being used, and that *one* eye to a hill was entirely sufficient.

Again, I found that some farmers considered the *seed-end only* as fit for planting, and I also found one farmer of our county who cuts off the seed-end and feeds it to his cows, reserving only the stem-end for planting. Amid all this disparity of opinion, I could hardly find any one who could substantiate his belief by any personal trials of his own; but he said he had "heard it said" so and so.

On only one single point was there any general agreement among potato-raisers as to seed; viz., that the tuber selected should be of medium size, — not small, nor very large. Finding that there was no established theory in regard to

it, in the spring of 1879 I determined to try an experiment for my own advantage, and to settle, so far as I was able, the vexed questions.

I selected one-fourth of an acre, and divided it into two equal parts; and, after preparing the ground as usual, I planted the rows three feet apart, and hills eighteen inches, putting into the hills two hundred pounds of Mapes potato-manure. The preparation of soil, and, after cultivation, of each part, was made as near alike as possible. The only difference was in the seed, which was prepared as follows: taking tubers of medium size, I divided the seed-ends from the stem-ends, and, cutting them down to two eyes, planted the stem-ends on one part, and the seed-ends on the other part. The result was as follows: on the part planted with seed-ends there were 2,010 pounds, or thirty-three bushels and a half of merchantable potatoes, and on the other part there were 1,890 pounds, or thirty-one bushels and a half of merchantable potatoes; showing a difference of sixteen bushels per acre in favor of the seed-end for planting. I would say also that the quantity of small potatoes on each part did not vary materially; but the seed-end ones were the earliest to germinate, blossom, and mature. This experiment, I thought, tended to show that there was not much difference between the two ends of the potato when used for seed. A single experiment, however, will not establish any principle. If a number of trials at different times give the same result generally, some dependence may then be placed on the conclusions drawn therefrom. Therefore, wishing to follow up this matter still further and on a broader scale, in the spring of 1880 I took one acre of land well adapted for the crop, and, after ploughing it seven inches deep and harrowing it thoroughly, furrowed out in rows three feet apart, and sowed four hundred pounds of Mapes complete potato-manure as evenly as possible in the rows, and mixed with the soil. The land was then divided into eight plats of twenty rods each. Four of the plats were planted with parts of the stem-end of the potato, and four with parts of the seed-end. The hills were marked, the seed dropped; and the planting on all of the plats was done on the same day, viz., the 20th of April; and the cultivation of each plat was made as nearly as possible the same the rest of the season.

Of course the crop could not be expected to be as large as might be raised; for I was willing to sacrifice something if I could also ascertain something in regard to the best kind of seed of the right amount. The result will be seen most clearly by the following table: —

	Number of Plat.	Kind of Seed.	Weight of Seed in Pounds.	Weight of Crop in Pounds.	Crop in Bushels.	Weight of Large Potatoes.	Bushels of Large Potatoes.	Weight of Small Potatoes.	Bushels of Small Potatoes.
Stem-end	1	One eye . .	18	960	16	912	$15\frac{1}{4}$	48	$\frac{3}{4}$
	2	Two eyes . .	30	1,500	25	1,408	$23\frac{1}{2}$	92	$1\frac{1}{2}$
	3	Four eyes . .	46	1,815	$30\frac{1}{4}$	1,652	$27\frac{1}{2}$	163	$2\frac{3}{4}$
	4	Half of potato,	60	1,440	24	1,234	$20\frac{1}{2}$	206	$3\frac{1}{2}$
Seed-end	5	One eye . .	19	1,050	$17\frac{1}{2}$	1,015	17	36	$\frac{1}{2}$
	6	Two eyes . .	24	1,560	26	1,470	$24\frac{1}{2}$	90	$1\frac{1}{2}$
	7	Four eyes . .	47	1,905	$31\frac{3}{4}$	1,745	29	160	$2\frac{3}{4}$
	8	Half of potato,	61	1,560	26	1,320	22	240	4

The potatoes used for seed were medium-sized, of Burbank variety. In plats Nos. 1, 2, 5, and 6, the hills were fourteen inches apart, and those of plats Nos. 3, 4, 7, and 8, were eighteen inches apart.

It is evident that the seed-end of the potato is fully as productive as the stem-end, and no wise man will throw it away. On plats Nos. 1 and 5 I had the largest potatoes, it taking only fifteen of them to fill a peck measure; but there was not seed enough. On plats Nos. 2 and 6 the potatoes were large enough, and a gain of nine and eight and one-half bushels, respectively, over plats Nos. 1 and 5. Plats Nos. 4 and 8 were not as good as Nos. 2 and 6, and had a greater proportion of small potatoes. The query is, Was there too much seed? I think there was. The best results came from plats Nos. 3 and 7, with four eyes in a hill. Here we find a gain of about sixteen bushels over plat No. 1, or a gain of one hundred and twenty-eight bushels per acre, — certainly a gain sufficient to pay for preparing the seed in the right manner.

From the above experiments I therefore deduce the following conclusions: the stem-end and the seed-end are both alike good for seed, the difference, if any, being in favor of the seed-end; neither one eye nor two eyes is sufficient seed

(unless the hills be made too thick for easy cultivation); nor is half of a large potato as good as a piece containing only four eyes.

FURTHER FACTS IN REPLY TO QUESTIONS BY THE AGRICULTURAL SOCIETY.

1. What was the area of land planted, the nature and condition of the soil, and the estimated value per acre?

One acre. Sandy loam, in fair condition for bearing thirty bushels of corn. Thirty or forty dollars per acre.

2. What crops have been raised on the land for the two preceding years?

In 1878, corn and fodder-corn; 1879, thirty bushels of corn and ten bushels of potatoes.

3. What was the kind, amount, and mode of application, of fertilizers for the present and two preceding crops?

In 1878, ten one-horse loads barnyard manure; 1879, four hundred pounds Stockbridge on corn, Mapes on potatoes; 1880, Mapes potato-manure, four hundred pounds in the drill.

4. How was the soil prepared and cultivated for each of these crops?

Ploughed once, seven inches; thoroughly harrowed; corn was hoed and cultivated three times; potatoes dropped in drill, covered with ridger; cultivated twice; ploughed once; hoed three times.

5. When, how many times, and how deep, was the land ploughed for the present crop?

April 15. Once. Seven inches.

6. What other preparation for the seed?

The land was thoroughly harrowed, then furrowed out three feet apart. The fertilizer was strewn in the furrows, and mixed with the soil. The hills were then marked, and the seed dropped on the mark, and covered about four inches deep with a tobacco-ridger.

7. What was the kind, amount, and mode of application, of fertilizers for this crop, calling a load of farmyard manure twenty-five bushels?

Mapes potato-manure, four hundred pounds. Sown in the furrow by hand.

8. What was the kind and amount of seed used, how prepared, when and how planted and covered, large or small potatoes for the present crop?

Medium-sized potatoes. Different plats planted with one eye, two eyes, four eyes, and one-half potatoes. From seed-end and stem-end of potatoes (see table annexed). Planted April 20.

9. What was the treatment of the soil, and cultivation of the crop to time of harvesting, with the date of each operation?

May 6, harrowed once; May 11, bushed once; May 22, cultivated and hoed; June 19, cultivated and hoed; June 25, ploughed between the rows, throwing up the dirt on the row, and finishing it off with a hoe, removing all weeds grass, etc. Applied Paris-green May 28, June 8, 19, and 25, using fifty pounds of plaster and three-quarters of a pound of Paris-green each time.

10. Time of harvesting?

Between Sept. 10 and 25.

11. Number of bushels of large and small potatoes, all to be measured or weighed at time of harvesting?

Large, one hundred and seventy-nine bushels and one-fourth; small, seventeen bushels and one-fourth. (See explanation and table annexed.)

12. What was the marketable value of the above product at any time prior to Dec. 31, 1880?

The current price in Greenfield has been fifty cents per bushel.

13. What was the cost or value of fertilizers, and its application?

Cost, ten dollars. Application, one dollar.

14. What was the cost of ploughing and preparing the soil, giving amount of time for team, with price of each?

Ploughing and harrowing, eight hours. For team, two dollars; man, one dollar; furrowing out rows, fifty cents.

15. What was the cost of planting, and of each operation in cultivation of the crops as above?

Dropping seed	$0 75
Planting	1 00
Harrowing	50
Bushing	50
Cultivating three times	3 00
Hoeing three times	8 00
Paris-green	4 60
Total	$18 35

16. What was the manner of planting, with the cost of planting, stating as above?

The rows were furrowed out, and the fertilizer sowed as evenly as possible and then mixed with the soil. The hills were marked off, the seed dropped, and then covered with a ridger, the whole operation costing one dollar and seventy-five cents.

17. State as nearly as possible the character of the weather during the season.

From the day the potatoes were planted, there were three weeks of dry weather; not rain enough to make them germinate evenly. The season was generally too dry for the crop, especially the first part of it.

APPLES AS FOOD FOR ANIMALS.

BY DR. JAMES R. NICHOLS.

The enormous crop of apples the past season has awakened much inquiry with regard to their food-value for animals, — cows, pigs, horses, etc.; and many statements have been made in the papers which are erroneous, and calculated to lead farmers and others astray upon the subject. We could not find at hand any reliable analysis of the fruit of the varieties such as are raised largely in our Northern States; and this circumstance determined us to make analysis of several prominent kinds, as the Tolman's Sweets, Hubbardston Nonesuch, and Baldwins. The apples selected were in different stages of ripeness, the Hubbardston being more advanced than the others. Very important modifications are produced by the chemical changes in apples as they approach the stage of maturity, or the period when they become mellow, and ready for the table. The amount of sugar increases, and the hydrated malic acid decreases, or disappears altogether in some fruits. The cell-walls of the structure become softened, and readily break down; oxidation begins at any point where imperfection or abrasions in the skin occur. The amount of nutritive material is to some extent increased in ripe apples, and they are much more easily digested and assimilated by men and animals.

The results of the analysis were as follows: —

HUBBARDSTONS.

Water	88.57
Albuminoids, pectose gum, and sugar	11.27
Ash	.16
	100.00

TOLMAN'S SWEETS.

Water	83.29
Albuminoids, sugar, pectose gum, etc.	16.54
Ash	.17
	100.00

The unripe Baldwins gave eighty-seven per cent water, with a less amount of albuminoids and sugar than the others, and considerable free hydrated malic acid. The sugar varied from about five per cent in the Baldwins to nine per cent in the Sweets. The total insoluble matters, including skin, seeds, pectine, ash, etc., averaged about 3.25 per cent.

These results show how largely preponderating in apples is the water, which in amount is about eighty-five per cent of their weight. Therefore a tree bearing thirty bushels (forty-six pounds to the bushel) holds up in the fruit about *half a ton* of water. The nutritive value of apples is, of course, not in the water, but in the solids, — albuminoids, sugar, and gum. In a bushel of Hubbardstons there is about six pounds of soluble nutritive material at the period of ripening; in Tolman's Sweets, about seven pounds; in Baldwins, five pounds; and this material will vary to a considerable extent in value. Sugar is a carbonaceous substance, and nutritive in a certain direction. It is mainly useful as fuel, and by oxidation serves to maintain animal warmth. The albuminoids are nitrogenous, and therefore are foods proper; the gum is also a food.

The albuminoids are seldom found above half of one per cent in any varieties, and this would give us less than four ounces in the bushel; of sugar we find in a bushel about two pounds and a half in acid fruits, and considerably more in sweets.

Our analysis of apples as presented shows that the amount of nutriment, or absolute food they contain in proportion to bulk, is small. In order to bring the facts home to the understanding of our farmers, let us contrast them with potatoes and some other vegetable foods. The following is an analysis of the Early Rose Potato, a variety extensively raised in New England: —

Water	78.01
Albumen, caseine, vegetable fibrine	3.19
Gum, pectine, and organic acids	3.06
Fat	.05
Starch	13.40
Cellulose and ash	2.29
	100.00

The amount of albumen contained was found to be .90 per cent, or double the amount in apples; of caseine there is a trace less than .02 per cent. The amount of water is less; and of starch, of which there is none in apples, we find more than thirteen per cent. Assuming a bushel of potatoes to weigh fifty pounds, we have rather more than half a pound of albumen, a few grains of fat and caseine, and about seven pounds of starch. These principles comprise about all that has food-value in potatoes. Contrasting the two sources of food, apples and potatoes, it will be seen that the latter have at least *ten times* the value of the former, unless an exaggerated estimate is placed upon the value of glucose contained in apples.

Pumpkins and parsnips contain, of albuminoids (the flesh-forming constituents of food), 1.06 per cent more than potatoes; carbohydrates (fat-forming material), eight per cent (parsnips containing much the more); and therefore have a much higher food-value than apples. Turnips occupy a low place in the scale of values in proportion to bulk.

A correspondent of an agricultural paper having stated, that, in feeding apples to his cows (the kind not stated), a bushel of ripe fruit gave him "a pound of finely flavored butter," let us briefly examine the statement. In order to do this understandingly, we must consider the elements of food which afford money-value, outside of the maintenance of the animal in health, and independent of any production of flesh. If we take a cow in milk, and feed her during twenty-four hours with a known quality of food (maintaining her of the same weight at the close of the experiment as at the commencement), we obtain valuable knowledge. We will give her of —

	POUNDS.
Water	120
Potatoes	30
Grass	15
	165

	Composition of the Food.	Composition of the Milk.	Composition of the Dung.	Excretions of Lungs, Kidneys, and Skin.
	Pounds.	Pounds.	Pounds.	Pounds.
Water	143.92	14.78	48.83	80.34
Carbon . . .	9.62	1.25	3.42	4.95
Hydrogen . . .	1.18	.20	.42	.50
Oxygen . . .	8.06	.64	3.01	4.41
Nitrogen . . .	.38	.09	.18	.11
Ash	1.84	.11	.96	.77
Totals . . .	165.00	17.07	56.82	91.11

The above table shows at a glance how the food has been utilized. In this case we have —

	POUNDS.
Utilized as milk	17
Indigestible matter	57
Waste of the body	91
Weight of food given	165

The half-bushel of potatoes and the grass give the solid constituents of the milk; the water supplies that fluid in the milk. The solid portion of the milk (the caseine, butter-globules, sugar, and ash) amounts to twenty-five ounces; the butter, about twelve ounces, — the result of feeding thirty pounds of potatoes and fifteen pounds of rich grass. If thirty pounds of potatoes and fifteen pounds of grass give at the best but twelve ounces of butter, what can be obtained at the best from feeding one bushel, or forty-six pounds, of apples alone? Compare the results of the analysis, and we reach approximate results of products. It is clear that a bushel of apples of the best ripe kinds fed to milch cows cannot return, by any possibility, more than two or three ounces of "finely flavored butter." The loose statements made by many farmers as the results of their experiments are not only worthless, but misleading. Thousands of these errors are circulating through the press; and their influence is not good.

As regards apples as food for animals, our practical experience in feeding them confirms the results of analysis. They are of *some* value, and, when fed in connection with meal, serve to give zest to the appetite, and keep animals in

health. The riper the apples, the better the results; and they should not be fed in a half-frozen state to milch cows, as this course will invariably cut short the milk-supply. If they are cooked by boiling, their value is much enhanced, as more perfect digestion results.

HAVERHILL, MASS.

GREEN FODDER ALL THE YEAR.

In stating my experience upon this subject, I shall necessarily repeat substantially much of a paper upon the same subject recently read by me before the Farmers' Club in New-York City. I have practised this system for three years, have applied it to common fodder-corn, red clover, pearl millet, West-India millet or Guinea corn, green rye, green oats, and mixed grasses in which clover predominated, with entire success in every case. The last year I preserved about one hundred tons, and during this summer I have put down about two hundred tons, and have added sorghum and sugar-cane to the varieties of fodder I have before preserved. I have never lost any fodder whatever thus preserved; but during the whole experiment it has been perfectly preserved, and better than when fed fresh and green from the field. As the first fermentation is passed in the process, the food thus preserved has no tendency either to scour or bloat the animals fed. It is eaten up eagerly and clean, leaf and stalk, without any loss whatever; and stock thus fed exhibits the highest condition of health and thrift. For milch cows, to which I have mainly fed it, it surpasses any other food I have ever tried. It increases the quantity of milk much beyond dried food, and the quality is better than that produced from the same fodder when fed fresh and green from the field.

The process in its results upon green fodder is not unlike that by which sauerkraut is made. So much is this fodder improved, and so completely is all waste of fodder prevented by this process, that I think all who try it with proper facilities will find it more profitable than the present method of soiling, with the crops already mentioned, fresh cut from the field.

In addition to the fact that fodder thus preserved has no tendency to scour or bloat cattle, another important advantage is gained by this process. These fodder-crops may be

allowed to attain a much larger and more substantial growth before cutting, than is practicable when the same crops are fed fresh from the field.

During my absence from home in the summer of 1879, my foreman had inadvertently allowed a field of about four acres of pearl millet to attain so large and hard a growth, that my cows wholly rejected the stalks, and would eat only the leaves when the millet was offered them green.

By way of experiment, and without much confidence in the result, I cut about one-fourth of this field, and filled one of my pits with it. The remainder of the field was cured by drying in shocks in the ordinary way. This last was found so nearly worthless for feeding dry, that it was used for litter in the barnyards, and for covering ice. That preserved in the pit was opened and fed in April last. My cows ate it all, leaf and stalk, eagerly, without any loss or waste whatever; and it was fully equal in value to the same quantity of the best corn-fodder preserved in the pits. I have this summer filled one pit with fodder-corn, after the stalks had attained full growth, and the ears were well formed. Of this corn, when fed green, my cows rejected fully one-half the stalk. I have no doubt this corn-fodder, when fed from the pit next winter or spring, will be found as valuable as any corn-fodder in my pits, and be eaten up eagerly, and entirely clean. Great economy may be found in allowing fodder-corn and other fodder-crops to attain a heavy growth, and then cutting them all at once, instead of cutting and feeding them piecemeal in the mode usually practised.

The process of preserving fodder in pits is exceedingly simple, and easily practised. The conditions of success are these: —

First, The preserving-pits must be wholly air-tight, so that, when sealed, the air cannot come in contact with the food preserved.

Second, The pits should be of such form and dimensions as will best facilitate the settling and compacting of the food into a solid mass, and, when opened for feeding, will expose as small a part of the surface to the atmosphere as practicable.

Third, The fodder must be cut green when in the best

condition or in bloom, passed immediately through the cutting-machine to reduce it to uniform short lengths of not more than one inch, and at once be deposited and trod firmly into the pit; sufficient salt being used to render it palatable, but no more. As fermentation, which will commence at once, proceeds, and the mass settles, the cutting and treading-in of fresh fodder must be continued at intervals of from thirty-six to forty-eight hours (depending upon the rapidity with which fermentation and settling proceed), until settling has ceased, and no more can be trod into the pit.

Fourth, The pit, as soon as completely filled, and settling has ceased, must be securely sealed to exclude the air wholly and arrest fermentation, and must be kept so sealed until opened for use.

My own practice is as follows: —

THE PRESERVING-PITS.

I make my pits of hard brick, with twelve-inch perpendicular walls well laid in cement, with smooth joints. If the ground is sandy or gravelly, the outside of the wall next the earth is covered with a coat of cement, or the walls are filled in behind with clay, or clayey earth, to prevent the passage of the air through them. The bottoms are also laid with brick upon the flat in cement. The pits are made from eight to ten feet wide, from sixteen to twenty feet long, and about fifteen feet deep. The deeper the pits, the more they will contain in proportion to measurement, owing to greater density of the contents from the weight of the mass above. In all cases where practicable, pits should be made at least twenty feet deep. The walls are made so smooth upon their inner sides as to offer no obstacle to the settling or compacting of the food by friction of the sides. These pits are made either open at the top and covered with a roof, or arched over, and covered underground, with two necks to each coming up to within one foot of the surface of the ground, through which they are filled, and the necks then sealed with earth. This last construction I have found most convenient in connection with basement stables, to which the food is carried or wheeled by a passage from the pits through the foundation-walls of the stable. In this construction I make one pit parallel with this foundation-wall;

and, from the side of this pit most distant from the stable, other rows of pits are made at right angles with and connecting with this and with each other by doorways.

It will be seen from this construction, that as many tiers of pits may be made, end to end, at right angles to the first or entrance pit, as may be required and space allow; and that, after the contents of this first or entrance pit are fed out, each of the other rows of pits may be opened and fed out, one pit at a time; and that only the surface of the food at the end of the one pit which is being fed will at any time be exposed to the air until the whole are fed out, — and this without opening or disturbing the necks of the pits above, which remain sealed. Any other form or construction of pits which answers the conditions may be used. Pits or wells open only at the top, either round, elliptical, or rectangular, may be used, the food being put in and taken out through the top only. Such pits would have one advantage, — that successive croppings might be put in the same pit, one above the other, each being sealed with a layer of earth when put in. Where sufficient depth cannot be got above water, pits may be made partly above and partly below the surface, the earth excavated being used to make a broad and firm embankment around them to their tops.

It is important that the pits be so constructed and located, that the fodder, as drawn from the field, may be deposited conveniently at or over the top of the pits, and the cutting-machine may be so placed, that the fodder, when cut, will fall as readily as possible into the pits. The fodder, when green, being very heavy, it is quite important to avoid handling it unnecessarily.

FILLING THE PITS.

The green fodder is drawn from the field as fast as cut, and may be cut in any weather, except during rain. After running through the cutting-machine, it is deposited and trod into the pit firmly, until the pit is full. The doorway at the end of this pit, having already been closed by placing boards across it upon the inside as the filling progressed, is now sealed tightly by placing other boards, properly fastened, across it upon the outside of the jambs, and filling the space between the jambs with well-compacted earth, so that

no air can pass into the pit through this doorway ; the outer covers are then placed temporarily upon the necks of this pit above, and covered over with earth to the level of the ground above. A second, and, if the cutting-force be large enough, a third pit may then be filled, sealed, and covered, like the first. After the first pit has been closed from thirty-six to forty-eight hours, the necks must be uncovered and opened. The contents will be found very warm and thoroughly wilted, and, upon being now trodden down, will occupy less than one-half, and, if clover, not more than one-fourth, of the pit. The pit should then be filled again, trodden firmly, and covered again temporarily, as before. The second and third pits should then be opened, and filled a second time in the same manner as the first one. Each pit should now be opened, and refilled, as before, at intervals of from thirty-six to forty-eight hours, the contents at each time being trodden down as firmly and evenly as possible; and this should be continued until settling nearly or quite ceases, and the pits are full. Salt should be sprinkled occasionally over the fodder while the pits are being filled, sufficient only to make the fodder palatable.

The pits, being now full, and settling having nearly or quite ceased, must be immediately and thoroughly sealed over the whole top surface of the fodder by a well-compacted layer of clean earth not less than six inches thick. This covering of earth should be afterwards examined, at least twice, at intervals of a week or ten days, and any cracks that appear be closed with fresh earth. A covering of straw or hay not more than two inches thick may be laid over the fodder before the earth-covering is applied ; but this is immaterial other than as a matter of neatness. In feeding, the fodder should be cut down, and fed from one end of the pit, in sections of convenient width, the earth being first removed from each section. If open pits are used, a layer of hay or straw may be put over the pit, when filled and sealed, to protect the contents from frost in winter, if necessary. I have not found any pressure or weight upon the fodder, other than the earth-covering required. If additional weight is desired, a heavier covering of earth will accomplish this, and make the sealing at the same time more perfect.

MIXING FODDER IN THE PITS.

Much advantage will be gained by mixing clover, and grass in which clover predominates, in the same pit through fodder-corn, millet, or sorghum. The clover becomes, after the first fermentation, a putty-like mass, which fills the interstices in coarser and more fibrous fodder, and thus makes the whole much more compact and weighty than it would otherwise be, while it improves the quality of the food.

By this system red clover, fodder-corn, pearl millet, West-India millet, or Guinea corn, hitherto the most uncertain, difficult, and expensive to cure and preserve of all our crops, become the easiest and least expensive in these respects; while their value as cattle-food is greatly increased over the same crops cured by drying in the usual mode. This system, when understood and practised throughout the country, may become no mean factor in our national prosperity.

By it, through the great increase of the best cattle-food, which may be produced at greatly diminished cost upon the worn lands of the Eastern and Middle States, these lands may be renewed and enriched, and their owners be materially aided, especially in dairying, in their now difficult competition with the cheaper and richer lands of the West.

By it, also, the Southern States, below the line of our Northern grasses, are enabled to feed and fatten their cattle in winter and summer, as well, and nearly or quite as cheaply, as where tame grasses abound.

O. B. Potter.

New York, Sept. 15, 1880.

THE CULTURE OF CORN.

[From the Eighth Annual Report of the New-Jersey State Board of Agriculture, 1881.]

BY HENRY STEWART, BERGEN COUNTY, NEW JERSEY.

Corn is the basic crop of American agriculture. If the annual product, equalling the enormous amount of a billion five hundred million bushels, or nearly fifty million tons or five million railroad car-loads, be valued at the point of export in comparison with other crops, we should have the following figures: —

Value of average crop of corn	$900,000,000
Value of average crop of cotton	200,000,000
Value of average crop of wheat	500,000,000

But it would be far easier to double the product of corn than to double that of the other crops, and to produce a supply which should add a thousand millions of dollars to the wealth of the world. By only moderately good culture this end might be achieved in one year if we should set about it. There are, however, two difficulties, not practical but ideal ones, wholly in the way. One is that corn cannot be grown profitably by Eastern farmers; and the other, that it would be utterly impossible to dispose of such an enormous quantity of corn if it were produced. I want to show that both of these ideas are unfounded; that, by good culture, any farmer who has not yet tried to do it, or has not yet done it, may double his product if he will; and that, when he has done it, he need be under no apprehension of wanting purchasers for his surplus.

It has been the fashion to believe, or at least to say, that the farms in the eastern parts of the country are exhausted; that agriculture here is in danger of ruinous competition from the newer lands of the West, and that it is cheaper to buy Western corn than to grow it in the East.

If any thing could be needed to more clearly show the

fallacy of such an idea as this than the following figures, it would be difficult to discover it: —

	CENTS.
Freight on a bushel of corn from Chicago to New York . . .	30
Cost of fertilizer to produce a bushel of corn	9
Cost of fertilizer to produce one hundred and seven pounds of corn-stover	20

The fodder being worth all it costs, the fact remains that every bushel of corn grown beyond the natural unfertilized capacity of the soil, and up to its full fertilized capacity, can be grown for nine cents; while to bring a bushel of corn from the nearest Western market costs thirty cents, and sometimes more. To put this matter down in figures in a truthful manner (for otherwise there can be nothing more false than figures), I might borrow the following statement, which is based upon the estimates given by Professor George Ville, and the most accurate analyses of trustworthy agricultural chemists: —

Fifty-six pounds of shelled corn requires, for its production, of —

	POUND.
Nitrogen	.223
Phosphoric acid	.306
Potash	.186

The cost of these substances in a complete artificial fertilizer, such as the Mapes corn-manure, is precisely eight cents and eighty-seven hundredths. But lest it might be objected that this is theory and not practice, and does not prove what may be actually done in the field, I will mention what *has* been done in the field in the way of increasing the production of corn by the best methods of culture. Before this, however, it might be well to remark that agricultural chemistry has of late years become so practical a science, that it is a most satisfactory guide for the farmer who will take the trouble to study its results, and reason upon them as he would upon any other subject that is presented to him for intelligent thought. Further, the common idea that a soil can be exhausted is completely unfounded: it may be starved, and rendered incompetent for its work, just as a strong man who has labored for days without food will be on the verge of death for want of sustenance. He will truly be exhausted

in precisely the same manner as a farmer's field that has been worked without adequate manure for years is exhausted,—starved, in fact, for want of sustenance. *The soil itself is inexhaustible.* A poor field that would not produce ten bushels of corn per acre has the capacity to produce one hundred bushels per acre if it is brought out by adequate feeding with precisely the elements that are needed. When farmers begin to treat their fields as animals, to be fed with the precise food that is required, then, and not until then, will they begin to realize that their soil is as inexhaustible as it is irremovable, and that, so long as the soil remains, it can be made to produce crops. Were it otherwise, what a prospect for the human race, after a few generations should have made the earth sterile! This fact being, then, admitted, farmers can learn from agricultural chemistry in a short time, through the investigations of chemists, more than they could hope to know after a lifetime of field-work in the dark, and therefore should by no means despise this most valuable aid.

The chemist discovers for us that the soil that has been long cultivated is deficient in three important elements in plant-growth,—phosphoric acid, nitrogen, and potash; also, that the different crops, while they all require these elements, need them in varying amounts and proportions; and, further, that some plants (clover, pease, and other leguminous crops) have a capability of drawing from some source—the soil directly, we know, but whether from the atmosphere or from what other source indirectly, we do not know—nearly all the nitrogen they require, however much that may be. This is a most important fact, and shows how much we are indebted to the chemist for this knowledge, which we could never have learned without him; for nitrogen is the most scarce and costly ingredient of manures and fertilizers. A whole ton of barnyard manure contains only ten pounds of it, and that in a condition in which it cannot wholly be used and made available for several years; while, in a soluble and available condition in artificial fertilizers, it costs about twenty-five cents a pound: and, but for this knowledge of the chemist, we might be year after year applying this costly element to the soil when it would be unnecessary. Therefore, knowing this fact, we can easily see that we can grow

corn more cheaply than it could be grown otherwise; and in fact, if we had to supply all the nitrogen, it would cost more to grow it than it would come to when grown.

Corn is really a very easy and inexpensive crop to grow, particularly as regards its demands for this most expensive ingredient, — nitrogen. Suppose we compare one hundred bushels of corn (shelled) with thirty-five bushels of wheat: we will have —

	Nitrogen.	Phosphoric Acid.	Potash.
	Pounds.	Pounds.	Pounds.
One hundred bushels of corn contain,	89.30	30.60	18.60
Thirty-five bushels of wheat contain,	43.75	16.63	11.20

But recent investigations and past experience have shown, that, while wheat requires from one-half to full quantity of all the nitrogen to be supplied in a fertilizer, depending upon condition of the soil, corn, on the contrary, requires, even on comparatively poor soils, only about one-fourth of the nitrogen to be supplied as compared to what the crop contains. This changes the demands in a manure, for these respective crops, as follows: —

	Nitrogen.	Phosphoric Acid.	Potash.
	Pounds.	Pounds.	Pounds.
One hundred bushels of corn require,	22.32	30.60	18.60
Thirty-five bushels of wheat require,	21.87	16.62	11.20

So that where one may expect to grow, by the help of nitrogen, thirty-five bushels of wheat per acre, one might as reasonably expect to grow one hundred bushels of corn. Wheat cannot help itself to nitrogen, and must have it, as it were, put into its mouth (the roots are its mouth, in fact). Corn can pick up its nitrogen without help, gathering it probably from the accumulations in the soil, or digesting it from food that the less hearty wheat could not touch. This important fact was first made known by Charles V. Mapes,

whose attention, as an expert in the artificial fertilization of plants, has been for some years past turned to this subject. He has opposed the ideas of Dr. Lawes of England, and most writers, that corn should be placed in the list of grain-crops which require to be supplied with a surplus of nitrogen, but has insisted that it should be classed with clover, and the leguminous crops which yield large quantities of nitrogen in their product, but require a very inconsiderable supply. A very large number of experiments and practical results in the field have proved that Mr. Mapes's opinion is the true one, and that Dr. Lawes, not knowing the peculiar habit of our corn-crop, from unfamiliarity with it in the field, has been led into error. This, then, being the case, the problem before the Eastern farmer is very much simplified. He has already become familiar with the use of artificial fertilizers in growing wheat, and he must learn how to apply these to corn with advantage, and with them to make use of the best methods of cultivation, so that he can, by the use of skill, overcome the ease and cheapness with which corn is grown on the fertile Western prairies.

CORN-FERTILIZATION.

It has long been known by good farmers that the best corn-crops could be grown on a newly inverted sod. Some years ago, when residing in Pennsylvania, I thought I had succeeded remarkably well in growing a crop of corn, equal to more than seven hundred bushels, on a field of thirteen acres of heavy clover-sod, on which the clover, when it was ploughed in, was a foot high and quite thick. I was much impressed also to see, about the same time, seventy-five bushels per acre grown on an old and very thick grass-sod, ploughed in, on a very fertile farm in Delaware County in that State. These fields were prepared with all the careful methods known to good farmers, and consisted of naturally good soil. Nothing can be justly said in disfavor of such methods as far as they go ; but they do not go far enough. Farmers have to learn that it is not the sod so much which feeds the corn directly as they have supposed, and have been taught by some writers, but that the fresh sod, decomposing, exerts a secondary effect upon the crop by rendering the soil-particles more soluble ; by dissolving from them, in fact, in the process

of its decomposition, the phosphoric acid and the potash, which the corn requires; leaving its own abundant nitrogen for succeeding crops, after having supplied the corn with its moderate requirements in this direction. In agriculture "old things are passing away, and all things are becoming new;" and this old but good method of growing corn must pass away, and a new but better way must come into use. For we have reached the end, the maximum, of that kind of corn-culture; and, to attain our present aims, we must introduce some improved method. This is artificial fertilizing, either as a help to the old methods, or as a substitute for them. It may be very convenient for a farmer, as it is for me, whose chief product is milk and butter, to grow no other grain than corn, and to grow no grass or hay, but only clover, as a temporary help in the way of soiling cows in the summer-time, or to grow corn for sale instead of wheat or oats, which can be grown so cheaply in the West, and cannot be grown here so cheaply as corn may be. Then one cannot have sod to plough under for corn always, and must grow it on stubble, and often on a corn-stubble. I have grown three consecutive corn-crops on the same field, and shall grow a fourth next season, and expect the next crop to surpass any of the three former ones. I have grown a crop equal to one hundred and fifty bushels and forty-eight pounds per acre of shelled corn on a potato-stubble, and one hundred and eighty-nine bushels of shelled corn on two acres of oat-stubble; so that, with my new experience of late years, I look back on my old experience of more than a dozen years ago as obsolete, and belonging to a past time, as indeed it must necessarily be if we are to live by farming, For, if we cannot grow corn, what shall we grow? We may and should grow roots; but our cattle cannot live by roots alone, and we should have corn to sell as well as to feed, if we want. I am growing corn wholly by artificial fertilizing. From my first experience, four years ago, with artificial fertilizers, when twenty-five bushels and eight pounds of dry shelled corn was measured from a plot of exactly one-sixth of an acre, I have believed in artificial fertilizers. This corn was grown with one hundred pounds of Mapes complete corn-manure, or at the rate of six hundred pounds per acre. The one hundred and eighty-nine bushels of corn were grown on a part of a

field on very poor land, fertilized with twelve hundred pounds (two acres) of the same fertilizer. The first-mentioned plat was cultivated by hand up to the time the ears were forming, and was raked over with a hand-rake after that, which probably helped the yield somewhat. Others have done better than I have. E. S. Carman, Esq., the editor of "The Rural New-Yorker," raised last season, upon his Long-Island farm, one hundred and thirty-four bushels and one-half per acre of shelled corn on seven-eighths of an acre, fertilized with five hundred pounds of the same fertilizer, and one hundred and fifty-nine bushels and one-third on the best acre of a four-acre field, the average being one hundred and thirteen bushels and seven-tenths on the whole, with three hundred and fifty pounds per acre of the same fertilizer. This fertilizer is intended as a substitute for the best barnyard manure, and to contain all the ingredients required for the corn-crop. It is well known and understood now that it matters not in what form these elements are supplied, so that they are soluble, and that the artificial manure is so much better than the ordinary manure because it is soluble and available. If we compare the composition of the manure with that of the crop, we should have the following: —

	Nitrogen.	Phosphoric Acid.	Potash.
	Pounds.	Pounds.	Pounds.
Fifty bushels of shelled corn contain .	44.67	15.34	9.34
Six hundred pounds Mapes complete corn-manure	23.36	66.00	39.00

It is seen that there is a deficiency in the nitrogen, and an excess in the other ingredients, in the fertilizer. But, with our understanding of the character of the corn-plant, we can easily perceive that this should be no disadvantage, and should exert precisely the effect that may be noted in the crop; for, as in the six hundred pounds of fertilizer there are phosphoric acid and potash enough for more than two hundred bushels of grain, and we know that more than one hundred bushels per acre may be grown without increasing the stalks in the least by simply producing one large ear to

each stalk, and three stalks to the square yard, so the stalks or stover need not be considered at all, and only the grain be taken into account.

The method of applying the fertilizer is worth considering. Being soluble and concentrated, it needs to be ultimately mixed with the soil, and yet not be in excess, but be always present in reach of the roots. This is secured by repeated applications of portions of the fertilizer. The one hundred and thirty-four bushels per acre grown by Mr. E. S. Carman on Long Island was fertilized by using three hundred pounds of the fertilizer harrowed in before planting, one hundred pounds when the corn was six inches high, and one hundred pounds when it was eighteen inches high. With my largest crop the last portion was hoed in when the tassel was appearing. This is always a desirable practice when using these soluble fertilizers, because, within a few hours after applying them, even the ordinary moisture of the soil is carrying them to the roots, and the first shower tends to scatter them through the soil. It is more particularly advantageous with so rank and rapid a growing plant as corn.

THE CULTIVATION OF CORN.

For the largest yield of corn, it is desirable to keep the soil stirred on the surface only, and very frequently. This frequent stirring of the soil is of the greatest importance in dry weather, and after every rain when the surface becomes dry. I have had very many proofs of this. In growing sweet corn for market, I have hastened the maturity of the crop several days by weekly cultivation; not waiting for weeds, but making the stirring of the soil the sole object. Of course this keeps down the weeds, if it may be so said, before they have had time to grow. A few days after the corn has been planted, and before it is above the ground, a slight sloping-tooth harrow may be run over it with benefit, preventing weeds, and hastening the appearance of the plants. This is the right time to begin to push the corn; for two days at the start may save two weeks at the end of the season. But it does more than hasten the growth: it invigorates it, and makes strong plants. The plough should be banished from cornfields: it disturbs and injures the roots. There is no better implement for cultivation than the old-fashioned Share's

horse-hoe, which scrapes the soil first one way and then the other, and may go within one inch of the plant with safety. This constant cultivation is cheap. I have gone over an acre in one hour, working close to one side of the row, and have returned, working the other side of the row the next day, thoroughly finishing five acres a day. This costs thirty cents an acre, counting man and horse; and twenty cents an acre, counting the man only; for the horse costs the same whether he works, or stands still. Eight workings may be given for one dollar and sixty cents an acre, and three bushels of corn extra will pay for them. Is there any farmer who will say that this three bushels cannot be thus gained on the crop? By such constant working the corn may be planted in drills, and twenty-five to fifty per cent more plants grown. Small varieties, such as do not reach more than eight or nine feet high, may be grown in rows three feet apart and eighteen inches apart in the row, with two stalks in each stand. This will give nineteen thousand three hundred and sixty stalks to the acre. If each stalk bears one ear, and one hundred and ninety-three ears make only one bushel of shelled corn, there will be one hundred bushels per acre. There is a large margin in this for allowances, and yet a possibility of this large yield. But how is every stalk to be made to bear an ear? one may ask. I answer, by breeding the corn as one breeds his animals. Would a shepherd permit a lot of barren ewes in his flock, or the dairyman keep barren cows in his herd? Then the corn-grower should not suffer barren corn-plants in his field. The perfect corn-plant bears a staminate or male flower (the tassel), and a pistillate or female flower (the silk). The imperfect plant has the tassel and no silk: it is worthless, and cumbers the ground, producing no grain. How shall these be prevented? By cutting off the imperfect tassel, emasculating the barren male, that it may not impregnate other plants, and perpetuate its kind. Leave only in the field perfect plants to fertilize perfect plants. In time the imperfect seed will be bred out, and every stalk bear its ear. Nay, more: by breeding first, each stalk may be made to produce two or more ears, as the habit may be formed. Nature is plastic in the hands of the skilful, patient man; and he who can produce and perpetuate the wonderful variety of ornamental flowers which we have can surely do as much

with the useful ones. It is as sure as any thing that has been done by man; and this part of the cultivation of the corn-plant, in my opinion, is of greater importance than even the feeding. First comes the breeding, and then the feeding, ever and always, in plants as in animals. For what possibilities present themselves with this most magnificent plant, — one that can reproduce its seed one thousand times even now! If we can fix upon it this habit of multiple earing, and can feed it with rich, abundant, and acceptable food in proportion to its greedful capacity, why should we stop short of two hundred bushels per acre, now that we have easily reached one hundred bushels, and have doubled the yield of a good crop in the past ten years? Perhaps you say, for what purpose? What can be done with so much corn? I reply, there never yet was a useful thing produced that did not find its use. Did the inventor of the telephone stop to inquire if he could dispose of his instruments when he had made them? Did the glucose-maker ask, what shall I do with my sirup when I have poured it out like water, and I see no use for it now? Did the oleomargarine dairyman hesitate to throw out a hundred million pounds of his stuff in a year, wondering where would be the purchasers? And shall the grower of this noble grain, of which we make beef, pork, mutton, wool, eggs, poultry, starch, grape sugar and sirup, beer, alcohol, horse-power unlimited in extent, and bread for man, — can such a universal element of wealth go a-begging for uses? Each ton of it, besides, will create demands for labor. Railroads, ships, elevators, bags, books, clerks, gold, silver, banks, and a thousand other needs will be created for its handling; and, if in the next five years the present product should be doubled, every grain would find its profitable use. The world grows, and it grows because of the facilities given it to grow. Supply always creates demand. Abundance of food increases population. These are axioms proved by history. Often we reason backwards, and the man who fears to double his crops lest he cannot dispose of them reasons in this crawfish fashion. When railroads were first made, people were dreadfully afraid that there would be no use for horses; and some farmers were ready to weep at the dire prospect of the loss of this business of raising horses, and growing oats and hay. But look at the streets of the cities,

and around the freight-depots and wharves, and from these centres abroad through the whole land. The very same principle is at work wherever men live and work. It affects every product of industry, whether it is a board of lumber, a brick, an artificial stone, a gold or silver bar, a pig of iron, a new tool, a machine, a locomotive, a steamship, a balloon, a flying-machine, or a grain of corn. In truth, we cannot have too much of a good thing; and corn is a good thing: therefore let us grow as much of it as we can by means of every improved method of culture, and grow richer in the doing of it, and make the world richer too.

THE PIONEER INDUSTRIES OF ESSEX COUNTY.

[Address before the Essex Agricultural Society.]

BY MR. DAVID W. LORR OF GLOUCESTER.

I have taken for my subject the pioneer industries of Essex County,—planting and fishing, their past and present success. As the fishermen were first to occupy the field, I will consider their industry first; for, had it not been for them, your farmers of Essex County would not be here to-day.

In the records of the Great Council of New England is found, May 1, 1622, "that order is given for patents to be drawn for the Earl of Warwick and his associates, the Lord Gorges, Sir Robert Mansell, Sir Ferdinando Gorges." This order is regarded as referring to a division of the country from Bay of Fundy to Narragansett Bay among twenty associates, in which the region about Cape Ann fell to Lord Sheffield, who, on the first day of January, 1623, gave by charter, "to Robert Cushman and Edward Winslow" of the Plymouth Colony, "a certain Tract of Ground in New England in a known place there, commonly called Cape Anne, in which charter provision was made against disturbing any English inhabitant already there; provision was also made for 'Scholes, Churches, Hospitalls,' and the maintenance of Ministers, Officers, and Magistrats."

Previous to any action by the Plymouth Colony towards a settlement of this region, Rev. John White of Dorchester, Eng., having interested some merchants and other gentlemen there in forming a company, sent a small ship of fifty tons to plant in New England the foundation of a colony for the more successful prosecution of fishing voyages. Their ship came to the usual fishing-grounds, but, arriving late in the season, did not obtain a full fare, and "the Master thought good to pass into Mattachusetts Bay to try whether that would yield him any." Vessels heretofore had not fished so far west. Succeeding better than he expected, and finding the beautiful harbor of Cape Ann so handy, he

landed his little colony of fourteen men there, with their necessary provision and outfit, to commence a plantation; then with full cargo of fish he sailed away.

Mr. White tells in few words, in the "Planters' Plea, a pamphlet published in London in 1630," why this colony was established at Cape Ann. He states, that, "about the year 1623, some western merchants, who had continued a trade of fishing for cod, and bartering for furs, in those parts, for divers years before, conceiving that a colony planted on the coast might further them in their employments, bethought themselves how they might bring that project to effect; communicating their purpose to others, alleging the conveniency of compassing their project with a small charge, by the opportunity of their fishing trade, in which they were accustomed to double-man their ships, that, by the help of many hands, they might despatch their voyage, and lade their ship with fish while the fishing season lasted, which could not be done with a bare sailing company. Now, it was conceived, that, the fishing being ended, the spare men that were above their necessary sailors might be left behind with provisions for a year; and, when the ship returned the next year, they might assist them in fishing, as they had done the former year, and, in the mean time, might employ themselves in building, and planting corn, which, with the provisions of fish, fowl, and venison, that the land yielded, would afford them the chief of their food. This proposition of theirs took so well that it drew on divers persons to join with them in this work; the rather, because it was conceived that not only their own fishermen, but the rest of our nation that went thither on the same errand, might be much advantaged, not only by fresh victual, which that colony might spare them in time, but, withal and more, by the benefit of their minister's labors which they might enjoy during the fishing season; whereas, otherwise being usually upon those voyages nine or ten months in the year, they were left all the while without any means of instruction at all. Compassion towards the fishermen, and partly some expectation of gain, prevailed so far, that, for the planting of a colony in New England, there was raised a stock of more than three thousand pounds, intended to be paid in five years, but afterwards disbursed in a shorter time."*

* Babson's History of Gloucester.

This attempt to establish a permanent settlement of fishermen and planters on Cape Ann failed, Mr. White giving as a reason for the failure "the ill choice of the place for fishing. First, that no sure fishing-place in the land is fit for planting, nor any good place for planting found fit for fishing, at least near the shore; and, second, rarely any fishermen will work at land; neither are husbandmen fit for fishermen, but with long use and experience." Words as true to-day of the American fishermen as when uttered two hundred and fifty years ago.

You will hardly agree with him as regards "the ill choice of the place for fishing," when to-day Gloucester, "the harbor of Cape Ann," ranks as the representative fishing-port of the world, and the centre of the fishing business of America. With a fleet of vessels numbering 459, of over five tons' burthen, in 1879, of which nine were hauled up and eighteen lost during the year without realizing any stock, leaving 432 actively engaged in the various branches of the business for a part or all the year, there was a total tonnage of 25,471 tons, employing 4,703 fishermen. Original value of the fleet, $2,688,272; present value, $1,223,413. The "gross stock," or catch, amounted to $1,799,566 in value, which, after deducting "stock expenses," which are bait and ice with expenses procuring it, is divided equally between the crew and the vessel: one-half of one per cent to the widows' and orphans' fund is paid from the crew's part. In 1879 the crews of the vessels over twenty tons averaged a hundred and seventy-six dollars each for the time they were employed; and those in boats under twenty tons and above five realized an average of a hundred and eighty-four dollars and a quarter each.

These vessels caught 116,034 barrels of mackerel, salted and fresh, and 60,920,558 pounds of other fish, which includes 11,336,716 pounds in "gross weight" of halibut, which realized to the vessels $376,378 for net weight, or heads off.

There were also 345 boats and dories, of $10,000 value, under five tons, employing 468 fishermen, who caught $96,500 worth of fish, sold mostly fresh, or 7,426,000 pounds. There were also employed 79 men, 74 dories, and 2,399 lobster-pots in catching 2,538 barrels of lobsters, worth $5,000.

In curing the fish, 43,567,922 pounds of salt were used, valued at $48,473.

A total of 878 vessels and boats were employed in Cape-Ann fisheries, manned by 5,250 fishermen, which caught 116,034 barrels of mackerel and 68,346,558 pounds of other fish, besides the lobsters; their whole catch realizing, when landed, $1,901,066.

Three hundred and seventy-five thousand boxes were used in transporting fresh and salt fish, and boneless codfish. Twenty firms are engaged in preparing and boxing boneless codfish, the demand for which has so increased during the past ten years, that fifteen million pounds will be prepared the present year, the preparation and packing of which, after the fish are cured, employing from two hundred to three hundred men, and some women. Three thousand tons of fish-waste were sold in 1879, at about seven dollars and fifty cents per ton, to enrich the soil.

Even with this showing of its importance and value, this location, unless the great industry now rapidly concentrating there receives the attention and protection of the National Government which it is entitled to and surely needs, may yet become an "ill choice of place," not, however, from any fault of locality, but from the inconsiderate statesmanship of those who should have protected its industry.

Let us again look at Mr. White's reasons for failure, and consider the farms of Gregory, Ware, Patch, and others on the seashore, and also at West Gloucester, where, within two miles and a half of where the first fishing-stage was erected on Cape Ann, one "planter," or farmer, has this year cut from an acre and a sixteenth of land five tons and four-tenths of first-rate English hay from two crops, and still has another to cut, which good judges call *at least* one ton more, making his hay-crop from that field at the rate of six tons to the acre; another has raised from a hundred and forty-seven square rods two hundred and thirty bushels of merchantable potatoes, besides several bushels of small; while still another has a seedling peach-tree, the growth of his wife's planting, which ripens its fruit as early as the third week in July, of such superior quality that it sells readily, far above any Southern peaches then found in the market. All of which

conclusively proves, that, with a little more money and perseverance, this first attempt would have been successful, and Cape Ann would have had the honor to head the list of distinguished men who have been governors of Massachusetts with the name of Roger Conant, one whom some historians believe to be entitled to that place.

The pioneer ship of the Dorchester Company was also the pioneer in a foreign trade from Essex County, she having sailed from Cape Ann with a full cargo for Spain in 1623, — the first foreign shipment from an Essex-county port, which grew afterwards to a large and profitable trade. Fifty-one thousand three hundred quintals of fish, almost wholly the products of Marblehead and Cape-Ann fisheries, were shipped from this county to Bilboa alone during the year 1767, bringing back valuable cargoes in return; which foreign trade in fish direct from our ports, or *viâ* the fishing-grounds to that and other Mediterranean ports, continued into the present century.* Boston has now taken the foreign trade from Salem and other ports in our county, and Gloucester has absorbed the fisheries from Marblehead and other ports, Marblehead having had two hundred and fifty-one fishing vessels in 1775, against seventy-five at Cape Ann; while in 1879, Marblehead (customs district) had only a hundred and twenty-three, of over five tons' burden, against four hundred and fifty-nine at Gloucester.

The Plymouth Colony, which had given no particular attention to the fisheries previously, "sent a ship in 1624, called the 'Charity,'" from that colony to erect salt-works and a fishing-stage at Cape Ann. Before the arrival of their ship, the following year, another, sent by merchants and adventurers from England, hostile to the Pilgrims, had entered the harbor, and seized the stage and other provision made by the "Charity's" colony the year previous; and the "Stage Head" (afterwards fortified in the Revolutionary war and wars of 1812 and 1861) was barricaded with hogsheads, and the rightful owners, under Capt. Miles Standish, were kept

* One hundred and fifty-three thousand five hundred quintals of fish, worth $537,250, were shipped to European ports, and 118,000 quintals of fish, worth $306,800, were shipped to West Indies annually. Just before the Revolutionary war, from Essex County, a total of 273,500 quintals, $844,050 in value, were exported; Marblehead shipping 120,000 quintals, and Gloucester 77,500 quintals. — *Pitkin's Commerce of the United States*, 1816.

at bay. Then ensued a war of words, bloodshed being only arrested by the prudence and moderation of Roger Conant, the governor of the Dorchester Colony, and Capt. William Pierce, "a goodly man and most expert mariner of the Pilgrims' ship," who induced the Pilgrims to retire, and build a new stage elsewhere. With the close of this year's fishing, the Plymouth people abandoned Cape Ann as a fishing-station, although both their vessels, "well laden, went joyfully home together, the master of the larger ship towing ye lesser ship at his sterne, all ye way overbound."

"Discouraged by their losses and the ill success of their plantation, the Dorchester company abandoned their design of planting a permanent plantation or colony at Cape Ann. At the end of their third year, measures were taken for selling their ships and breaking up their settlement, having lost almost all the capital they had invested in the enterprise."

"In planting colonies," says Mr. White, "the first stocks employed that way are consumed, although they serve as a foundation to the work." It was thus with the planting of the colony at Cape Ann: the stock was consumed; but the foundation-work was laid on which now rests a leading State of one of the greatest of nations. Roger Conant, with some of the best men of this colony, remained until the following year, when they moved to Naumkeag, now Salem. The crooked and irregular path taken by the "kine" along by the seashore, when driven to Naumkeag, tradition says, afterwards became the travelled road between Salem and Gloucester, now occupied by so many summer residences.

Conant remained at Naumkeag, locating in that portion now Beverly, where his plantation had less rocks, no doubt with more congenial, though no better, soil than he had found at Cape Ann. Here he died at the age of eighty-six, after a long, useful, and honorable life, being one whose "lack of titles will never take from his name the high and honorable place it should hold in the annals of our Commonwealth as one who had always preferred the public good before private interests; and this in his closing years he praised God that he had done."

Through the encouragements and promises of Mr. White, who has been called "the father of the Massachusetts Colony," Conant and others had remained at Naumkeag, and

they were no doubt rejoiced on the 6th of September, 1628, when the ship with Endicott and company made its appearance, which had been sent with the resolution to erect "a new colony on the old foundation." The next year it was followed by others, and in 1630 by the great emigration under Winthrop, which firmly and permanently planted the colony of Massachusetts.

"Marbleharbour," now Marblehead, became a fishing-port, so celebrated even then, that in 1629, in a letter written that year, it was stated that "sixteen hundred bass were taken in one draught, while the schools of mackerel were so numerous as to extort exclamations of astonishment from all beholders." "In 1633 Matthew Craddock, the governor of the Massachusetts company, and others, had fishing-stages at Marblehead, and sent their vessels and men there to catch and cure the fish, returning with their cargoes at the close of the season."

Gloucester became an incorporated town in the second month of 1642; "and it is an interesting fact that within the first year of her incorporation Gloucester built her first vessel." Gloucester also has the honor of building *the first schooner*.

"Capt. Andrew Robinson had built in 1713 a vessel which he had mastered and rigged in a peculiar manner, the same as the schooners of the present day. When launched, the peculiar skipping motion she made as she glided into the water from the stocks caused one of the bystanders to exclaim, 'Oh, how she scoons!' Robinson instantly replied, while dashing a bottle of rum against her bows, 'A scooner let her be.' Since that time the same class of vessels have been called schooners." * And would it not be well for some antiquarian to ascertain if the skipping motion she made when she entered the water did not obtain for her master the name of "skipper"? a title still continued in the fishing-schooners. "About seventy of these 'scooners' were owned in Gloucester in 1741; and nearly all of them engaged in fishing on the Grand Banks, whence, after securing their cargo, they would go to Lisbon, Bilboa, or Cadiz, and bring back wines, salt," etc.

Just prevoius to the Revolutionary war, five hundred and

* Babson's History of Gloucester.

forty-two vessels were engaged in the fisheries from Massachusetts, of which three hundred and twenty-six belonged in Essex County, distributed as follows: Marblehead, one hundred and forty; Cape Ann, seventy-five; Salem, thirty-four; Beverly, thirty; Manchester, twenty-five; Ipswich, twelve; and Newbury, ten; employing over twenty-five hundred men, in seventeen thousand tons of shipping, actually engaged in fishing, whose products amounted to one hundred and fifty thousand pounds in value. The Revolutionary war and other causes reduced this fleet from three hundred and twenty-six sail to one hundred and eighty-eight in 1790.

The fisheries suffered severely, in the latter part of the last century and the first of this, by wars and disasters, the fishermen becoming extremely poor, while, judging from the prices paid in Lynn in 1817, I should think the "planters" might have been in pretty good condition. As the source of information gives a short item comparing the prices of 1817 with 1829, I will give it you entire as I copied it from "Gloucester Telegraph" of 1829, as follows: —

"'The Lynn Mirror' shows that the price of living is reduced less than one-half since 1817, while labor is as high as it was ten years ago."

	1817.	1829.
Flour per barrel	$16 00	$6 25
Flour per fourteen pounds	1 30	50
Meal per bushel	2 00	70
Molasses per gallon	70	34
Tea, Y. Hyson per pound	1 60	90
Coffee	25	14
Sugar	18	12
Candles	22	13

In 1819 the United States, finding the fishing industry impoverished and declining, passed a bounty act, *which should have been styled indemnity act*, giving to each vessel under thirty tons three dollars and a half per ton, for three and a half months' actual employment cod-fishing. Vessels over thirty tons, carrying not less than ten men, received four dollars per ton, provided it did not exceed three hundred and sixty dollars for any one vessel; three-eighths

going to the vessel, and five-eighths to the crew. This act (which was repealed at close of war of late Rebellion) gave a new impulse to the business, although Gloucester in 1828 had increased her fleet to one hundred and sixty-four schooners and thirty-eight boats. Marblehead in 1831 had fifty-seven vessels in cod and mackerel fishery, their catch amounting to $160,490, each fisherman averaging $213.52 for eight months' fishing, mostly on the Grand Banks, which fishery was not then followed by Gloucester vessels.

In 1820 mackerel-fishing as a business was prosecuted, and has continued with greatly varying success ever since. The mode of catching mackerel, until the past ten years, was by hand-lines: now they are caught by boats from the vessel, by rowing around a "school" when they show themselves on the surface of the sea, and throwing a seine, which, if successful, encloses the fish in a basin of net-work, the bottom of the seine being pursed up. In this way hundreds of barrels are sometimes taken at a single haul.

The George's Bank cod-fishery commenced in 1830, from which dangerous shoal the largest and best codfish are taken. This fishery is prosecuted with hand-lines, the tide running there so swift as to require frequently over one hundred fathoms of line to reach the bottom. In 1836 the fresh-halibut fishery commenced, and is now one of Gloucester's specialties. To what extent the business has reached, I have already shown, except the amount sold smoked, which is very large. In 1870 this fishery was commenced on the coast of Greenland with success, and has been followed more or less since. The halibut caught there is fletched; that is, strips are taken from the fish, clear of bone, to be dried and smoked. Two hundred and eighty thousand pounds were brought from there last year by two vessels, only one prosecuting it this year. In 1876 halibut were caught on trawls in water two hundred and fifty fathoms, or over quarter of a mile deep, having been found for the first time in the deep water off George's Bank. Trawling for them or for codfish is pursued now on nearly all the banks.

The mackerel-fishery in British waters has been almost wholly abandoned by vessels from this county, and also, I think, from the State; it having been found unprofitable to prosecute it so far from home when better fishing is found on the American coast.

Herring voyages have been prosecuted since 1856, to supply our cities with cheap food and our fishing-vessels with bait, the herring having been caught by the fishermen of Newfoundland and sold to our vessels, where they are frozen, and in that state brought home in bulk, like potatoes, by the cargo. After the award on the Washington Treaty, an attempt was made by American fishermen to catch their own bait with their own seines, and, having got them full the only day that they had "struck in," their seines were destroyed and their voyages broken up by a mob of the natives; and the business has been wholly abandoned except by purchase, and but few vessels engaged, compared with what there had been. Recently, vessels there from the Banks after bait, while catching squid in one of the coves, were mobbed by some two hundred and fifty natives, and their lives threatened if they did not desist; in one case injuring two of the crew and driving off the vessel, and in another, while the master was ashore to buy bait, taking possession of the vessel, heaving up her anchor and hoisting her sails, when she narrowly escaped shipwreck, being saved from the rocks only by the utmost exertions of her crew, who had hid below, and her master, who, seeing there was trouble, had returned. The mob, becoming frightened at the danger of the vessel, had, in the mean time, left her to her fate.

Many think that the American fishermen are always getting the nation into trouble. *How few know that the nation it is that is getting the fishermen into trouble!* Right here let us look at the matter; for it is a serious one to the nation, as well as to this industry.

Before the war of the Revolution, by the treaty of Paris in 1763, the fishermen of all the British colonies had "equal rights" granted them with those of Great Britain to fish in any waters, except around a few islands reserved by the French, and to land upon the shore for curing fish, drying nets, etc. Then followed the Revolutionary war, when, by the treaty of 1783, a division of the country was made with Great Britain, and all the rights heretofore enjoyed by American fishermen were continued to the fishermen of the United States with slight and unimportant alterations. They had obtained what they were entitled to after seven long years of struggle; viz., independence of Great Britain, and equal rights with her in the sea-fisheries of America.

Then followed the war of 1812 by a declaration of war by the United States, which declaration, it was claimed by the English, revoked all our rights and privileges to the inshore fisheries of the British Provinces. The American commissioners denied that it had done so, and instead of having the point in dispute settled then and forever, or fighting it out, as had been the question of the right claimed by Britain to stop and search our vessels on the high seas for British seamen, *they shirked the responsibility*, and the treaty of 1814 was made without mention of the fisheries.

The American Government claimed, and the fishermen used, the rights confirmed to them by the treaty of 1783 the same as before: with what result? They were harassed and troubled by British cruisers, who made captures for *alleged* infringement of their fishing laws. What did our government do? Fight for their rights? No: they appointed another commission to settle it. And how was it settled? Another treaty was made, called the treaty of 1818, — a treaty which took away almost all the fishermen's rights of 1783, making him next to an outlaw in British ports. Hear it! After providing for right of fishery on a portion of the southern, western, and northern coasts of Newfoundland and coast of Labrador, rights now of little value, and the shores of Magdalen Islands, listen to what *the American commissioners inserted* in that treaty: —

"*And the United States hereby renounces forever* any liberty heretofore enjoyed or claimed by the inhabitants thereof, to take, dry, or cure fish on or within three miles of any of the coasts, bays, creeks, or harbors of his Britannic Majesty's dominions, not included within the before-mentioned limits; *provided*, *however*, that the American fishermen shall be admitted to enter such harbors for the purpose of shelter, of repairing damages therein, of purchasing wood, and of obtaining water, and for no other purpose whatever. But they shall be under such restrictions as shall be necessary to prevent their taking or curing fish therein, or in any other manner whatever abusing the privileges hereby secured to them."

What sagacious and far-seeing statesmen to *gratuitously* renounce the rights of the fishermen as they did! For Richard Rush, in a letter to the Secretary of State, July 18,

1853, states, "*We inserted the cause of renunciation. The British plenipotentiaries did not desire it.*" What has been the result to American fisheries and the nation's welfare? I will tell you. The British construction put upon where the three-mile limit should be measured from, and of the conditions of the *proviso*, as means by local laws to drive American fishermen from their harbors and their coast, has been a constant source of irritation and perplexity to our government ever since. Numerous vessels have been seized for *alleged* violation of the treaty. Two subsequent treaties have been *forced upon* our country, disastrous to American fisheries, and $5,500,000 has been paid, *and nothing settled yet.* You ask, what has been gained by this lack of judgment (to put it mild) in our statesmen of 1814 and 1818? This is the true answer, — *nothing.* The increased profits on exports to provincial ports, during the Reciprocity Treaty, hardly compensated for the loss of duty on their imports. The advantage of open ports and free fishing, given us on their part, was more than balanced by their profits on trade with our vessels, together with free fishing and free ports to them in our waters.

Under the Washington Treaty, the amount of duties remitted on their importations of fish is *four times as much yearly* as all the fish caught by American fishermen within three miles of their shores *is worth, when sold in the ports of the United States;* making no allowance for cost of catching them, which *was more than they sold for.** The American fishermen have no more right to-day to enter a provincial port, except under that *rigid proviso* of the treaty of 1818, than they had before the Washington Treaty was made

* The average yearly fleet of American vessels fishing in British waters since the Washington Treaty took effect, including 1879, has been 136. Their total catch of mackerel, outside and inside the treaty limits, averaged 32,633 barrels yearly, the average total value of which, when landed in the United States, was $250,849; value of vessels and outfits, $716,000. Total value of vessels, outfits, and catch, $966,849; showing that the yearly average amount of the fishery award, with the remitted duties on Canadian fish added (upwards of $350,000), which our government is paying annually for *the privilege of trying to catch fish swimming in the sea* within three miles of the shore, is equal to, or more than, yearly, the value of all the American vessels, with all their outfits and catch, that fished in British waters anywhere.

Does any one wonder that such treaties excite indignation when made directly against the protests of American fishermen, and ostensibly for their interest when it is their destruction?

(unless they can yet claim the right under the treaty of 1783). British cruisers or officials can seize a vessel now, as they have before, for merely purchasing bait in their ports, and *the treaty of Washington cannot prevent it.*

There cannot be any reciprocity in fish. Great Britain now *cannot deliver what she has sold.* When she sells the bread from her fishermen's mouths, they will prevent its delivery, as they have at Newfoundland, where the poor natives depended, to keep them from starving, mainly upon the purchases, by American vessels, of herring, squid, and caplin, for food or bait.

You ask, what proof have you of these statements? My reply is, that I have them from the most reliable sources, too lengthy and too dry for this occasion. One of much importance in relation to the *decrease of vessels* of twenty tons' burden and upwards in this county, and in other custom districts of the State, between 1873 and 1879, engaged in catching fish for food, is too important to be left out, and I here give it: —

District.	Number of Vessels.	Tonnage.
Essex County	115	5,338.17
Boston and Charlestown	22	1,282.64
Plymouth	18	762.19
Barnstable	95	5,793.68
Nantucket	2	115.82
Total decrease	252	13,292.50

A loss of over one-quarter of the whole fleet of 1873 (of twenty tons' burden and upwards), throwing at least twenty-five hundred men out of active employment in the fishing-vessels, with half as many more at least on land, causes an annual loss in the bare catch in the fisheries of Massachusetts of over one million dollars as compared with 1873, nearly one-half of which comes from Essex County. This is a loss yearly, to this State alone, of much more than the average yearly amount of the fishery award paid by our government, with the remitted duties on Canadian fish added.

In the five years previous to the Reciprocity Treaty of 1855, Gloucester, as well as all other fishing-ports, shows a large increase in valuation *per capita*, a large falling-off during the time of that treaty, an increase afterwards between 1866 and 1873, and again a large decrease under the Washington Treaty. Essex built less fishing-vessels since the Washington Treaty yearly than it has any previous years during the past forty, having built an average of forty-three vessels *yearly* between 1845 and 1855, and fourteen yearly since the Washington Treaty.*

As there may be some curiosity to know how the Canadian fleet has stood since the last treaty, compared with that of this State, I will state, that between 1873 and 1878, by their fish commissioner's reports, is shown *a gain* of 489 vessels, 19,858 tons, 2,990 men; and 5,171 boats, 11,195 men, — *a total of* 5,660 *vessels and boats, with* 14,185 *men added to their fisheries in five years.*

Some may ask, of what interest is this to the farmers? I will tell you. First, The fishermen are producers, and add to the general wealth. Second, They are large taxpayers, for they consume annually a large amount of merchandise which would pay a high duty to import. Third, they furnish employment for a great many mechanics and laborers, who, with their families, have to be fed.

You can form some idea, when you consider *the yearly consumption in the Gloucester fishing-vessels alone*, of agricultural products, which are: of cotton in sails, nets, and lines, 1,662,888 pounds; rice, 25,920 pounds; sugar, 128,640 pounds; molasses, 29,376 gallons; flour, 6,912 barrels; beef, 4,104 barrels; pork, 864 barrels; pork shoulders, 1,512 barrels; lard, 13,072 pounds; butter, 210,248 pounds; beans, 1,720 bushels; pease, 864 bushels; dried apples, 64,800 pounds;

* Sixteen fishing-ports, including Gloucester, *gained* an aggregate average valuation for each inhabitant, during the five years previous to the Reciprocity Treaty, of twenty-two dollars yearly; between 1855 and 1866, during that treaty, three dollars and twenty cents each yearly. Between 1865 and 1870, after that treaty expired, their average gain was ten dollars and sixty cents each yearly. Thirteen ports, the others having changed to manufacturing, had gained an aggregate average of ten dollars and sixty cents each yearly. Between 1870 and 1875 they had gained forty cents each yearly, against an average gain of six dollars to each inhabitant of the whole State; since 1875, losing. Gloucester has lost in aggregate average valuation, between 1873 and 1880 inclusive, over eight dollars yearly for each inhabitant.

potatoes, 35,826 bushels; onions, 2,592 bushels; beets, 1,296 bushels; turnips, 1,728 bushels; cabbages, etc., worth $12,-960; vinegar, 2,592 gallons; fresh beef, 86,400 pounds.

When you think of what this consumption of such products alone has been, decreased from what it was in 1873 by the decrease in the fleet, do you not believe that England should be called upon and required to pay for every cent of damage caused by her failure to perform her part of the contract? She can not, however, and will not compensate sufferers for the irritation, the vexatious delays, and indirect damage she has done to the business. Nothing short of the abrogation of the treaty, with renewal of duties on her fish, will bring her to terms.

I am glad, for one, that this administration, both State and National, understand the importance of the interests at stake, and have shown backbone in the matter. The members of Congress, and others from the fishing-district, as also from the "heart of the Commonwealth," have rendered valuable assistance toward having the fishery clauses of the Washington Treaty abrogated, with the duties on fish renewed. When this is done, then will the American fishermen keep the American markets supplied by increasing their fleet and fishermen, instead of decreasing them. But now our government is allowing a foreign marine to build itself up by entering our ports, duty free, to supply our markets, and drive out a home industry that has stamped upon the records of our country, from the time of the first plantation on Cape Ann to the present time, its services upon sea and land, so that it should upon a future page be recorded, "*The industry that furnished such men has been blotted out of existence by the acts of the National Government.*" When such a record is made, will it not be an everlasting disgrace to American statesmanship?

It was my intention to have traced the progress of the planters as I have that of the fishermen; but time and space did not admit. You, being better acquainted with the farmers' industry than I am, will pardon me for the time I have devoted to your sister-industry; and if I have awakened in you, and by you in the farmers of our land, a fresh interest in the success of American fisheries, I shall feel that in addressing you I have no just cause for repentance.

There have been as great changes in the mode of farming and in the crops raised in this county as there have been in the fisheries. In looking back to the transactions of this society fifty years ago, I find how much interest was taken then in the culture of the mulberry-tree and the raising of silkworms, twenty-five dollars being the first of five premiums offered by the Society for the best nursery of white mulberry-trees for the making of silk. Then three premiums of thirty, twenty, and ten dollars were offered for the best plantations of a thousand trees on not less than an acre, in the third year's growth from seed, the offer continuing for five years on each of the following kinds: viz., white oak, locusts, larch, white ash, and chestnut.

Among the "hints to farmers," a record is given of crops raised at different times, in different parts of the county, to the acre: such as, wheat, 26 bushels; Indian-corn, 117¼; barley, over 52½; potatoes, 518½; carrots, 900; mangel-wurzel, 1,340; ruta-bagas, 688; beets, 783; English turnips, 814; onions, 651; which are considered pretty good crops in these days. Then in those years the ladies received premiums for such articles as "list carpeting for rooms and stairs," "grass bonnets, made from meadow-grass of very delicate manufacture," "silk stockings and lace veils, samplers and knit purses," one premium being for "a bonnet made of the down of milkweed."

In 1835 fifteen dollars was offered as a premium "for the best barrel of cider produced at the exhibition of 1836, made within the county. If found worthy of the first premium, to be used at the table without any additional payment."

Orchards of apples and pears were then in their infancy, when compared with the present. I am informed by one of the largest shippers of apples that last year, the "off year" for apples, two hundred thousand barrels, the product of Essex County, worth over half a million of dollars, were shipped to foreign countries, and about the same will be shipped this year; and, as fruit-picking time has arrived, let me tell you what he says about picking apples for shipping. He says, "Pick your apples before they are fairly ripe, so that they will wilt a little, and handle them very carefully like eggs, making two liberal culls as you put them in your barrels, looking out not to rob the cider-heap on the second

one; barrel them under your trees as you pick them; shake them down carefully, pressing in the head with considerable pressure, so that an apple will not move in the barrel. After being headed up, turn them down on the bilge, and in teaming, handling, or storing, keep them on the bilge all the time, because there is less weight on the apples. On the same day they are picked, put them in the cellar, throwing open the door and windows occasionally, never picking them over until the barrel is opened for use: every time they are handled they sweat afterwards, and sweating promotes decay. Let a man put twenty-five barrels of apples in his cellar, and set the barrels on their head, and keep picking them over as fast as they rot, and he will be picking out rotten apples all winter, with but few sound in the spring; but let him put twenty-five barrels, picked, handled, and stored, on the bilge in the cellar, and let them alone, as I recommend, and they will all come out sound in the spring, with perhaps here and there an apple rotted so dry as not to affect any other. Baldwins and Russets are best for shipping, with Hubbardstons for early shipments."

With this statement I will close by expressing my heartfelt wish for future success to the pioneer industries of Essex County.

HARVEST-HYMN.

[Sung on the occasion of the address before the Essex Agricultural Society, at their sixtieth annual exhibition, in Lynn, Sept. 20, 1880.]

BY MISS MARCIA M. SELMAN.

"And some an hundred-fold." — On every side
We see the witness of the written Word
Amid the glad earth's harvest-time, and lift
Our hearts in praise to thee, Creation's Lord.

The seed that grew — we knew not how — beneath
The ministry of air and sky and soil
But shaped in glowing type thine endless love,
Thy benediction on man's year of toil.

Oh, thus within our lives the hope enlarge
Of bounteous store for all the seed we sow!
Give it the increase from thy day and night,
Alike from summer sun and winter snow.

Thou art Creator; but a Father's care
The golden autumn's fruitfulness supplies:
Man is creator only where his hand
Works by thy law, and on thy truth relies.

Fair Nature lights thy shrines within her woods;
Her altar mountain-tops with incense blaze;
The sacramental feast is spread to thee,
Crowner of good, and Author of our days.

THE SOCIAL AND INTELLECTUAL LIFE OF THE FARMER.

[Address before the Housatonic Agricultural Society.]

BY REV. L. S. ROWLAND OF LEE.

There is a story that an Englishman, a Frenchman, and a German were once requested each to write a treatise on the elephant, an animal that neither of them had ever seen. The Englishman, with his thorough-going, practical instincts, took the next steamer for India, in order to get his knowledge at first hand from his study of the animal in his native haunts. The Frenchman, following his literary proclivities, began at once to ransack libraries for works on the subject, that he might know what other men had thought about the elephant. The German, in sublime reliance on the power of his *a priori* philosophy, sat down in his study to evolve the abstract idea of an elephant from the depths of his own inner consciousness.

In responding to the request of your president to speak to-day on the social and intellectual life of the farmer, I am sorry to say that I must follow to a large extent the method of the German. Though a son of the soil myself, my youthful propensities were so strongly in another direction, that I fear I did not profit much by my agricultural experience, as I am certain that agriculture did not profit much by me. My reading of books has been as remote as possible from the agricultural line, and so I am thrown back on the inner consciousness as my main reliance in the emergency. I am not certain, however, that my lack of practical experience as a farmer is altogether a disqualification for the service to which I am called to-day. Farmers, doubtless, need, as do other men, to see themselves as others see them. The outside view may for some purposes be quite as important as the inside view. It is possible that, looking at your calling as an observer and critic, I may say some things as worthy your attention as if I had always had a place in your ranks. At any rate, I have less scruple in speaking with

such slender resources to draw from, that I know I cannot mislead such practical minds as yours, even if I cannot instruct them. You, gentlemen, have all seen the elephant, and will be able to tell at once whether my description of him is a portrait or a caricature.

THE WEAK SIDE OF AGRICULTURAL LIFE.

It is my conviction that my topic touches agricultural life on its weakest side. Its meagreness in social and intellectual influence as compared with most occupations, I think few thoughtful and candid minds will question. It is so from its nature, or, at least, from circumstances difficult to control. Three limiting or hindering influences will at once occur to the thought of all. In the first place, farming does not demand, as do most other occupations, constant intercourse with men: it rather forbids such intercourse. A great part of its activities must be carried on in comparative solitude. Its success does not require, as does that of most occupations, the co-operation of other men, and constant contact with other minds. The merchant, for instance, is dependent on his customers. He comes in contact with them all the time. A kind of social and intellectual influence is inherent in the very nature of the calling. So it is with the lawyer, the physician, the clergyman, the teacher. A constant contact of life with life, and of mind with mind, is an element inseparable from these professions; and, though seeking other objects as their ultimate end, some cultivation of the social and intellectual nature is one of their necessary incidents. Even the life of an ordinary mechanic is in this respect more favorable than that of the farmer. The village smithy and the village shoemaker's shop are always a kind of social centre. Men are continually gathering there by twos and threes to discuss politics and the news of the day; and, though the discussions may not be very refined or very profound, yet they do tend in a measure to the quickening of the mind. The farmer's contact, on the other hand, is not with man, but with nature. The life, especially of the small farmer who is his own hired man, is passed mainly in solitude; and it is inevitable that his lack of social opportunities, without very strong effort on his part to counteract the deficiency, should in the course of years leave a marked impress on his character.

ISOLATION OF FARMERS' HOUSEHOLDS.

The comparatively isolated situation of the farmer's household is another obstacle in the same direction. In this respect our custom differs materially from that of the continental countries. In Germany, for instance, the agricultural population is not dispersed like ours on isolated homesteads, each family upon its own farm, but is gathered into small villages from which the laborers go out to their work in the morning, and to which they come back at night. The influence of this gregariousness upon the German peasant is of course more than balanced by others that tend to the repression of the intellectual life; but there can be no doubt that it is in itself an advantage. The results of our own method are not so apparent in our thickly settled Massachusetts as in other sections of the country; but even here the farmer's isolation is such as to prove a decided obstacle in the way of that attrition of mind with mind that all men need to their best development. Some one — I believe it is Col. Waring — has suggested some re-adjustment of our agricultural life in accordance with the continental method; but such a change, especially in the older parts of the country, is plainly out of the question, nor am I certain that it would be on the whole desirable, even if possible. There is a charm about the typical New-England farmhouse, standing in its independence and self-sufficiency among its group of outbuildings, like a feudal castle in the midst of its dependent cottages, — a charm that we could ill spare; and there are, unquestionably, advantages in other respects in this isolation, although unfavorable to the freest intellectual and social life.

THE FARMER'S EXHAUSTING LABOR.

A third obstacle is the exhausting nature of the farmer's work as usually conducted. The life of most farmers is in this respect simply that of day-laborers. In most cases it is doubtless a necessity, and there, of course, I have no criticism to offer. Necessity knows no law but its own. Even objects so important as culture and refinement must yield to its imperious demands. But are there not some cases where this exhausting toil is kept up from force of habit, from

avarice, or from sheer ambition of work, when necessity has begun to relax somewhat the sternness of its grip? I have known many farmers, who could amply afford to lead lives of comparative ease, still continuing their labor in the fields with their workmen, beginning as early, working as late and as hard, as the best of them. It was thought to be necessary, to get the most out of help and to get the work properly done, that the employer should thus lead the field. The master-mechanic does not find it necessary to lead his journeymen in this way in their rougher work, but confines his activity to direction and supervision; and why cannot the farmer of means do the same? He is unconsciously doing a double wrong by pushing his ambition of work so far beyond the bounds of necessity, — first, to himself, in the loss of that refinement of mind and character which his prosperity has brought within his reach; and, second, to poorer men who need employment in order to a livelihood.

FARMERS' WIVES.

And what is true of farmers in this respect is equally true of their wives, with whom the necessity or the ambition of work not only stands in the way of their social and intellectual culture, but is often fatal to health, to happiness, and to life itself. They are on the whole, I believe, the hardest-worked class in the community. It was, I imagine, a worn-out farmer's wife who wrote, or suggested, a recent poem entitled "A Tired Woman's Wish," in which she gives expression to her highest idea of heaven as a place where she might "do nothing for ever and ever." But, severe as woman's lot is on the farm, it is doubtless much less severe than it was in former times; the cheese-factory, the creamery, and the milk-train serving to relieve her from some of the burdens that pressed so heavily on the mother and grandmother before her. And the same amelioration has been effected out of doors by the use upon the farm of labor-saving machinery, in which the use of horse-power and steam-power are put in the place of the wear and tear of human muscles. We are not likely, I think, to over-rate the elevating effect which these means for saving labor will ultimately have on the life of the farmer and his household. I never see a farmer on his mower or reaper, riding like a king

or conqueror through the harvest-fields where his ancestors toiled like galley-slaves, without seeing in the machine something more than an appliance for increasing the products of the soil: it becomes an instrument for a still higher use, for the culture and refinement of the farmer himself. For, say what you will about the dignity of labor, — and no one, I am sure, can have a higher appreciation of that truth than I have, — too much labor with the muscles tends to the repression of the social and intellectual life. A man who spends twelve or fourteen hours a day in the severest manual toil is not likely to have much vigor left for any thing else. He will think only of his supper and his bed as he goes wearily to his home at night. Nathaniel Hawthorne in his diary, kept when he was a member of the community at Brook Farm, gives a very amusing description of the depressing effect of his unaccustomed manual labor upon his power of mental production: "In the midst of toil," he says, "or after a hard day's work, my soul absolutely refuses to be poured out on paper. It is my opinion that a man's soul may be buried and perish under a dung-heap, just as well as under a pile of money." "Oh, labor is the curse of the world, and nobody can meddle with it without becoming proportionably brutified." This, of course, is written in a spirit of pleasantry and exaggeration; and yet it embodies a truth. I find in my own experience that any bodily exercise or labor approaching severity is fatal to mental activity for the rest of the day. And so I have the inestimable privilege of being lazy for conscience' sake. Every man has a certain maximum of energy: if he puts it all into his muscles, of course he has none left for his brain. If the labor is necessary, there is nothing to be said; and no doubt, to the mass of farmers, whatever ameliorations the future may bring, it always will be necessary to a degree that will constitute a special obstacle in the direction of higher culture. I have dwelt thus long upon it, because, to my mind, it is one of the most obstinate facts with which we have to deal in estimating the possibility of a more satisfactory, intellectual, and social life for farmers as a class.

IMPRESS ON THE FARMER'S CHARACTER.

Such to my mind are the leading obstacles that farmers must meet and surmount in their struggle upward to a higher plane of character and living. That they are formidable is evident enough, and all the more so because not accidental, but inherent; bound up, in fact, with the very nature of the occupation. Their entire removal is, therefore, not to be expected. The most to be hoped for is that their depressing influence may be in a measure counteracted. But, before proceeding to suggest some means by which this may be done, it is well to inquire whether the limitations of which I have spoken are after all to be regarded as serious evils. Is any marked impress for the worse left by them on the farmer's character? I think such an impress is left, some of the points of which I will briefly state. And, if the picture shall seem less flattering than you could wish, you will not resent the criticism, even if you cannot accept it. You are not here, gentlemen, I take it, to be complimented and coddled, but to receive in a manly way such hints as may be helpful to you in the conduct of life. If I were studying any other occupation, my own not excepted, I should doubtless find influences unfavorable to the best development of mind and character.

SLOWNESS OF MIND.

This impress is seen, in the first place, in a characteristic slowness of mental movement. Emerson says of the farmer, "He is a slow person, timed to Nature, and not to city watches. He takes the pace of seasons, plants, and chemistry. Nature never hurries: atom by atom, little by little, she achieves her work." "The farmer times himself to Nature, and acquires that lifelong patience which belongs to her." But it is not the influence of nature alone, I imagine, but of nature combined with solitude, that makes the farmer so characteristically slow in his movements. Such is the constitution of mind, that it can be quickened to its highest activity only by contact with other minds. Solitude doubtless tends to cultivate individuality, and independence and depth of thought; and, where there is great native force, there may also be a good degree of mental activity in a life

comparatively solitary. But for most men society is indispensable to the completest mental development. Especially is it needful to that quickness of mind demanded in the stress and hurry of our modern life. An hour of hand-to-hand fight in argument will do more for most men in exciting the mental faculties, and in striking out new thoughts, than would days of private meditation. Here, it seems to me, we have the capital deficiency of the farmer's intellectual life; not in soundness of thought, but in alertness of thought. I should have as much confidence in the average farmer's judgment on ordinary subjects, when arrived at, as in that of most other men; but, if I were in a hurry, I should not like to stay until he had made up his mind. How the contrast strikes one in passing immediately from country to city! There questions are answered almost before they are asked. The change is ready for the customer before he has had time to even guess at its amount. Vanderbilt would negotiate the purchase of a thousand miles of railroad, or of ten millions of government bonds, in the time it takes the typical farmer to sell a bushel of potatoes or to exchange morning salutions with his neighbor. In estimating the correctness of this opinion, you must not take such communities as most of those represented here, where so many quickening influences come in to modify the distinctive features of agricultural life: you must take communities purely agricultural. You must take farmers as a class. And nothing, I think, can be more evident than that they are characterized by a moderation of mental movement, marking them off at a glance from men of most other occupations. And there can be no doubt that they are, in consequence, placed at a disadvantage in the competitions of life. It is an interesting fact in the political history of the country, that so many of our prominent politicians and statesmen have risen from the shoemaker's bench. And what was the reason? Evidently the constant friction of mind with mind to which the shoemaker's calling as formerly conducted gave opportunity. He could talk and argue as he worked; and, having always an audience or opponents in his customers or fellow-workmen, latent talent was developed, and his mind was trained to an activity that prepared him eventually for the halls of legislation and the seat of magistracy, as in the case

of Roger Sherman and Henry Wilson. And so with many other occupations admitting of close and constant mental contact. I have not at hand the statistics to verify the opinion, but my impression is a strong one, that the ratio of farmers who have risen to eminence directly from the plough — that is, with no other training than that gained in the solitary life of the farm — is comparatively small. Is not this fact, if it be a fact, a suggestive one? Does it not indicate a lack of quickening influence in agricultural life that demands a remedy, if remedy be possible?

TENDENCY TO EXCESSIVE CONSERVATISM.

Closely connected with this slowness of mind, and equally apparent, is a tendency to excessive conservatism in the farmer's character. Here, again, I remind you that I speak of the class, and do not forget the fact of marked exceptions both in communities and individuals. In all countries and in all ages the agricultural class has been marked for its reverence for the old, and its suspicion of the new. It is almost inevitable that its prevailing spirit should be conservative. The natural influence of its environment is all in that direction. And not seldom has it been greatly to its advantage and to the advantage of the world that it has been so. Farmers have been themselves saved by their conservatism from destructive innovations, and have constituted an impregnable bulwark against their spread in the community. But quite as often is it disastrous in its influence, leading to the retention of old ideas whose usefulness is at an end, and to a hostility to new discoveries essential to prosperity and progress. The superior intelligence of New-England farmers has saved them from the worst effects of this undue reverence for the past; but I think few will deny that even here it has stood in the way of agricultural progress. But for this, would not labor-saving machinery have had an earlier adoption? Would not agriculture have received speedier and heartier recognition as a *science?* And would not the farmer's life in all its aspects be more completely abreast the civilization of the times? Occasionally we have an instance, even in Massachusetts, of the old conservative spirit in all its obduracy. I have heard recently of a Berkshire farmer who still clings to the tallow candle

of his fathers, regarding lamps and kerosene, I suppose, as an invention of the devil. And the farms are not few among the hills, where all the appliances look like relics from Noah's ark, and the farmer, like the patriarch himself at the end of his long imprisonment on board. But more especially out of New England, in this country and in other countries, do we find evidence of this extreme conservatism in the agricultural class. Nor is its influence limited to the bounds of the farm, but spreads itself more widely, giving tone to political and religious opinion, and leaving its impress on the entire character. It is this spirit that makes the landed class in England to so large an extent the bulwark of Toryism, and that has led the farmers of Pennsylvania to vote regularly for Andrew Jackson at every presidential election for the last fifty years. The fact of this conservatism in farmers as a class, I think few will question. Is it not equally evident that it stands in the way of their best welfare?

NARROW UTILITARIANISM AND DISREGARD FOR BEAUTY.

A third trait of the typical farmer's character that must not be overlooked is a tendency to a narrow and shallow utilitarianism. The limitations and stress of his life incline him to measure every thing by purely material standards. His constant question is, "Will it pay?" and by pay he means exclusively dollars and cents, or their equivalent, too seldom taking into account any of the higher and remoter returns from outlay in the way of character and refinement. The result is a kind of barrenness in the life of many of the thriftiest farmers to be expected only in the lot of poverty. How many farmers who seem to care more for the fattening of their pigs, and the training of their colts, than for the welfare of their families! How often does the barn engross attention to the neglect of the house, the horses and cows having the benefit of more modern improvements than the wife and children! But more especially does this utilitarian spirit show itself in utter disregard of the element of beauty. Said a Vermont farmer recently, born and bred amid the most beautiful scenery of the Green Mountains, "Where is all that wonderful Vermont scenery that I hear people rave about so much? I have lived here all my days, and never have seen it." I wonder if some of these Berkshire farmers

have not been equally oblivious of the marvels of beauty in the hills and valleys about them. It would certainly seem so: for in some of the finest locations in the county I see the barn, with its unsightly surroundings, placed, as of set purpose, to cut off the prospect from the house; and the instances are quite exceptional of any marked attempt in the direction of beauty, even on farms that have been in possession of prosperous families for successive generations. It is not what we should expect, judging in advance. We should say that every farmer, living in such closeness of contact with the natural world, would be something of a poet in his appreciation of its beauties. But the general fact is evidently the reverse. The typical farmer realizes in this respect too exactly Wordsworth's picture of Peter Bell: —

> "A primrose by a river's brim
> A yellow primrose was to him,
> And it was nothing more."

The grim spirit of utilitarianism has in great measure crushed his sense of beauty; and, whether it be his misfortune or his fault, the result is the same in giving to farm life an unattractive aspect. It makes the farm distasteful to the young, and gives a strong impulse to the current of emigration that is constantly setting from the country to the city. It has disastrous results on the farmer himself, drying up the fountains of his enjoyment, and generating a spirit of melancholy and absolute insanity. It is a significant fact with regard to our insane asylums, that, among the occupations furnishing the patients, farming stands at the head of the list. The proportion of suicides among farmers is also large. I trust they have got over the tendency now; but I remember that in my boyhood they had a disagreeable habit of hanging themselves for fear of coming to want. And, strange to say, it was always well-to-do farmers who were disposed thus to shuffle off the coil of life by the use of a coil of rope. What can be the cause of such strange facts as these but the unsatisfactory nature of the farmer's intellectual and social life? for mental monotony and barrenness tend quite as strongly as mental excitement to unbalance the mind.

THE POSSIBILITY OF IMPROVEMENT.

Now, are these features of which I have spoken a necessity in the life of the farmer? May it not, without the sacrifice of any thing else that is really worth keeping, take on more of the graces? Is it not possible to break through these limitations, stern as they are, and to secure for the farmer an intellectual and social life in some degree commensurate with his other advantages? It doubtless is possible, for it has been done. It surely does not become the farmers of Southern Berkshire to despair of the possibility of higher intellectual life on the farm, with the "apple-blossoms" of poetry descending upon them so thickly from the summit of Mount Washington. Is it not a fact worthy our study, this blending of the finest potatoes with the finest poetry in the products of "Sky Farm"? Nor is the instance altogether exceptional. Scattered here and there through the land, we may find many a farmer's household marked by a similarly genial intellectual life. There is great encouragement, also, in the general progress made of late years, and now making. I have not intended in the sombre picture that I have drawn by any means to ignore the fact of improvement. Indeed, in coming back recently to some contact with agricultural life, after twenty-five years of almost entire separation from it, I have been greatly impressed with the progress made in that interval. A parishioner of mine is in Holland for the third time within two years for the purchase of Holstein cattle for himself and neighbors. Twenty-five years ago, a thoroughbred cow or bull was as rare a sight, almost, as a Bengal tiger or an Australian kangaroo. In the discussions of the Lee Farmers' Club, which I occasionally attend, I have thought sometimes I should have to interpose my ministerial authority to keep the peace between the advocates of Ayrshires or Holsteins on one side, and of Durhams or Jerseys on the other, so fierce has been the war of words. And so with the use of machinery, and the amelioration of the farm-labors that comes in consequence, I think I am not mistaken, too, in my impression of a decided improvement in the general life of the farm, both in doors and out, since the time when, as a boy, it was my task to pick stones and mow bushes on one of the roughest farms of Eastern Hampshire. The possibility

of improvement in the farmer's character, notwithstanding his limitations, must then be admitted. But that much remains to be done, that agricultural life is still much too far behind the general wave of progress, seems to me equally evident. It remains to point out some of the means to be employed to bring the social and intellectual life of the farmer more nearly to the level of that of other professions.

RECOGNITION OF THE NEED.

The first thing needed, of course, is a clearer recognition by the farming class of the fact of its deficiency in the direction in which we are looking to-day. Without this, improvement is impossible, while the sense of the need will help much to its own remedy. What you need, gentlemen, as the starting-point of improvement, is what we of all professions need, a clearer sense of the danger that the profession may swallow up the man. Clergymen are sometimes buried out of sight and beyond resurrection in their white neck-cloths; doctors become walking pill-boxes; and lawyers and politicians — well, language fails me to say what they do become from their professional habit of making the worse appear the better reason. But the danger in your case is a special one. You need to be vigilantly on your guard lest the farm swallow up the man. Resolve, whatever comes, that your souls shall not be buried under your dungheaps. Stand superior to your cows and your sheep and your hogs, however aristocratic their pedigree. Let the most cherished product of the farm be its *human* product, the farmer himself and his family. While you must ask the question, "Will it pay?" as men of all callings must ask it, give to the words a somewhat broader meaning than has been your wont, remembering that man does not live by bread alone, but that there is a hunger of mind the claims of which cannot be disregarded without the sacrifice of the best part of manhood. What you need is a different way of looking at things, a higher estimate of the graces of life, and the willingness to sacrifice some other things in the effort at their attainment.

A MORE GENIAL DOMESTIC LIFE.

With the need thus distinctly recognized, let the work of amelioration begin in the home. A thoroughly genial domestic life will do much to remedy the lack of wider social opportunities. Do not work your boys and girls so hard as to break their spirits. Strain a point to give them and yourselves greater opportunities for reading. Interest yourselves in their studies and in their schools. Insist, indeed, that the comparative leisure of the winter months shall be made tributary to intellectual improvement. Consider a first-class newspaper an absolute necessity for the family, and let an occasional book come in with its quickening influence. Make the home pleasant in its externals. Clear the rubbish from the yard, and put the front-gate on its hinges. Make an improvement society of the family to render the farmhouse attractive in all its surroundings. Some of the farmers in my town, I notice, have been of late devoting considerable attention to the construction of sidewalks past their premises, and I doubt whether work was ever more profitably expended. Do not grudge the grown-up girls a tasteful parlor: they have special need of one, you know, at times. Nor is the matter of personal appearance and dress beneath your consideration. At your work, of course, you will dress in accordance with its requirements; but away from home, and among men, why should not the farmer, as much as other men, aspire to look like a gentleman? The reflex influence of dress upon the wearer is a matter of more importance than perhaps you have been accustomed to think. There was a modicum of truth in the remark of the young lady, that she never enjoyed religion so much as when she was conscious of having on a pretty bonnet. It is not the gentler sex alone who are susceptible to this influence from externals. Is it not possible that that ancestral hat of yours has performed all the service that in common humanity can be demanded of it? Let it go into honorable retirement in the garret, or use it to scare the crows, as it certainly will when they see it. Procure a modern well-fitting suit of clothes, and, after a proper patronage of the barber, surprise your wife with the sight of what a good-looking fellow you are. Give her similar opportunity

to surprise you. There will be found not a little, in the mutual admiration thus elicited, to heal family jars, and to bring back the experiences of courtship and of the honeymoon.

NEIGHBORHOOD FELLOWSHIP.

As a further means of improvement, let more be made of good-neighborhood fellowship, not only in the way of occasional social gatherings, but by stated organizations that shall combine some object of information and intellectual improvement with social enjoyment. A debating-club or reading-club, kept up regularly during the winter months in the district schoolhouse, or at the farmhouses in turn, would do wonders, in the course of years, to remedy the deficiencies in the farmer's life. Magazine and book clubs would supply, at slight cost to the individual good, reading-matter for whole neighborhoods. In my town we have a farmers' club, now more than twenty years old, that has accomplished much, not only in improving the methods of agriculture, but in quickening the intellectual and social life of its members. Why should there not be a similar organization in every town? It is not a thing to be deplored, that some of the social customs of the fathers died with them. The husking-bees, and other similar gatherings, with their rum and hard cider, with their late hours and coarse jollity, are mainly extinct; and may they never return! But may there not be something in their place, of a different kind, to meet the more refined wants of the present age?

INTERCOURSE WITH MEN.

Again, let the farmer consider it a duty which he owes to himself, to improve to the utmost his opportunities for mingling with his fellow-men. Let him imitate the example of professional and business men in taking a brief yearly vacation, when he may freshen up his mind by contact with new men and new scenes. Let him make an occasional trip to the city. Let him not shun public duty when it falls naturally to his lot. Do not seek office, but, if it comes, consider it as much your duty as anybody's to suffer and draw a salary for your country's sake. There is no telling, you know, nowadays, where the political lightnings may strike; and

so if your fellow-citizens elect you as selectman or county commissioner, or to the Legislature, do not in your modesty decline the honor, but go! Be willing to go anywhere in the line of patriotic self-denial, even to Congress, or to the White House! A little ambition and self-sufficiency will not hurt you a bit: it will help to lift you out of the ruts, and to break through the limitations that now surround your life.

INTEREST IN RELIGION AND ITS INSTITUTIONS.

I am not here to preach a sermon; but it would be a strange deficiency in this discussion to overlook one other means of improvement for the farmer, and that the highest of all: I mean an interest in religion and in religious institutions. In urging this point, I do not speak as a clergyman, but rather in the interest of social science. I do not urge, as perhaps I might, the importance of religion from its connection with the life to come, but from its connection with this life. I speak of it as a civilizer, as an educator, as a means of refinement to the intellectual and social nature. All men need its influence in this direction: the farmer especially needs it from his lack of other and unattainable means of culture. There can be little question, I think, that it was the religion of the fathers of New England that saved their intellectual and social life. Theological discussion quickened their powers of thought. The weekly attendance at church afforded the contact with their fellow-men needful for the cultivation of social sympathy. Their sacrifices to sustain religious institutions broke the crust of selfishness, and helped to the elevation of the entire character. Imagine them in their lot, in other respects so narrow and barren, without the influence of religion. What would have become of them? Why, they would have speedily sunk to the level of the aborigines about them. The sons need this influence as much as did the fathers. The farmer can do to himself and household no greater wrong than to shut out from his life and theirs this highest stimulus toward all that is true and beautiful and good. You might as well say that you cannot afford your daily bread, as to say that you cannot afford the money and the pains it may cost to bring the life of the farm into contact with the truths and institutions of reli-

gion. Are there not scores of farmers on these hills, who, from their neglect in this direction, are sinking gradually toward barbarism, and drawing their households down after them? I commend the thought to your serious consideration.

REVIVED INTEREST IN FARMING.

I will detain you with simply one other thought: it is, that there is much in the present aspect of the times to demand from the farming class a revision and improvement in its methods of life, in order to make the occupation more attractive. The recent long-continued depression of business turned public attention, as never before, to the comparative independence of the farmer's life. The advantages of an occupation, which, while it precludes the idea of wealth in the common sense of the word, yet seems absolutely secure against extreme reverses of fortune, making sure at least the comforts of life, is now appreciated as never before in recent years. But the great drawback still is the aspect of barrenness in the farmer's life. I doubt not there are hundreds of business men in our cities, who, discouraged by their repeated failures, would go into the country to-day, were it not for the feeling that by so doing they would deprive their families and themselves of so many of the refinements of life. A motive of patriotism and philanthropy therefore comes in to re-enforce that of personal interest in leading farmers to special effort to redeem their calling from this reproach. It is, perhaps, not too much to say that farmers now hold in their hands the solution of the great problem of modern times, which is such a distribution of the world's increasing population that all may be reasonably sure of a comfortable livelihood. Let them show by example that a good degree of refinement and culture is not incompatible with an agricultural occupation, and they will attract to it increasing numbers year by year, and thus help most materially to restore the disturbed balance between the rural and the city populations. More than that, they have it in their power to make the farmer's calling the object of special desire and aspiration. In England and some other countries the possession of land in fee is almost equivalent to a title of nobility. We can never have a landed gentry in this

country, nor do we want one. But considering the untold advantages of a farmer's life in other respects, in its independence and comfort, in its family associations gathering for successive generations around a fixed homestead, in its freedom from debasing temptations, and in its close communion with nature, which is so helpful towards communion with God, — with all these great and inalienable advantages, it would certainly seem that farming ought to be able to take on enough of the amenites of life to lift it to the queenship of human occupations, to make it in reality what it has always been in romance and song, the ideal life of mankind. This is certainly a consummation devoutly to be wished, and it is one the realization of which farmers hold in their own keeping.

ANNUAL REPORT

OF THE

AGRICULTURAL COLLEGE.

To his Excellency the Governor and the Honorable Council.

The Trustees of the Massachusetts Agricultural College respectfully submit their Eighteenth Annual Report.

In the last Annual Report a detailed statement was made of the efforts of the trustees of the college to contract the field of its activities to correspond with its diminished income and the mandate of the Legislature by reducing the wages for student labor, by discharging a portion of the faculty, lessening the salaries and increasing the duties of those retained, and by deferring the procurement of appliances to make the exercises of the recitation-room more efficient and instructive.

The resignation of President William S. Clark, whose popular talents and prestige as a successful educator contributed so largely to the success of the college during the first eleven years of its operations, and the two subsequent changes of its executive head, making three administrations in a period of ten months, were a very important part of these modifications, and were sufficiently radical and influential to derange or stagger an older and more thoroughly established institution. It is perhaps now too early to determine what is to be the ultimate result of these changes on the college as an educational institution, or on its position and influence in winning the community to such an accord with its plans and purposes as to secure the desired accession of students, and the sympathetic aid of a liberal public. The enactment of the Legislature of 1879, growing in part, undoubtedly, out of the strife of parties to secure the commendation of the people as the special champions of retrench-

ment and financial reform, and which made the Governor and Council a commission to examine into the status of the institution with the intent of severing its connection with, and releasing the State from, its obligations and guaranties to the General Government respecting it, culminated in a report to the Legislature of 1880, practically recommending that the college, with all its real and personal estate, with its trust funds received from the United States for its specific support, be given to Amherst College, and further effort to maintain it be abandoned. The phraseology of the resolve creating the commission and defining its work was so peculiar, that it had little or no discretionary power, and there was no other course for it to take. But it was a measure so radical and subversive of the integrity of the State, so forgetful of the intent and design for which Congress gave its endowment fund, that it not only met with no favorable public response, but with almost universal remonstrance, especially so by the agricultural portion of the community; and no effort was made by the Legislature to accept of the proposal, or to give it legal force. It is charitable to believe that the original authors of this measure had no intent to destroy or injure the institution for the benefit of another, but an honest purpose to relieve the tax burden of the Commonwealth. But the suspicion of such a purpose called out the latent friendship and sympathies of farmers and the friends of high education for agricultural pursuits, and aroused them to a consciousness of the fact, that, though the college was the ward of the State, its perpetuity, power, and influence could be enhanced by their active moral support. This effort to settle, or unsettle, the status of the college, resulted in giving it strength. And it may be reasonable to conclude that just this struggle was required to permanently establish its relations to the State, and to show that there must be a union of public and private duty and responsibility, if it would attain the highest prosperity and usefulness.

The operations of the past year have demonstrated the fact that the college can live, and secure, temporarily at least, a certain measure of success on its present basis. But we should remember that it was endowed by the Congress of the United States, with the approval of the nation, for

the legally defined but unique and noble purpose of giving advanced education to the producing classes, to secure their elevation, and increase their wealth-producing power; was adopted by Massachusetts, under bond to foster, maintain, and provide for it: and it cannot be seriously said that this basis is a credit to, or in keeping with, its high origin, or that it can be very efficient in accomplishing its originally designed work. The trustees act as the agents of the State, and are ready at all times to obey its behests by employing the means placed at their disposal, be they large or small, in the best manner their judgment can direct to secure the greatest and best possible results. But they cannot believe that the very large expenditures made during the early years of its history were enhanced by either extravagance or folly. They accepted in good faith the clearly expressed ideas of the originators of the college grant; and, guided by the detailed plan of the institution adopted by the Governor and Council by the direction of the Legislature, they made an earnest endeavor to provide for it in farm lands and buildings, dormitories and boarding-houses for students, structures for recitation-rooms and other public purposes, physical, chemical, and mathematical apparatus, and other appliances for the lecture-room, to elucidate the facts of science, and to convey knowledge, discipline, and culture to the pupil, — all this in the direction of, but not above, or hardly equal to, the model of it, which was exhibited in the Statutes of the United States and Massachusetts. The total of the expenditures for all these purposes was a large sum, but no larger than should have been anticipated by the legislators, who thoroughly discussed the objects to be attained, and adopted the plan, but too large in the opinion of any one who considered the plan to be simply that of a manual-labor school or one of an inferior grade.

In some respects, also, the period from 1867 to 1873, when the larger expenditures occurred, was very unfavorable. The sums appropriated were estimated and recorded as dollars; but to the trustees they were not dollars of a value currency. Neither could they be exchanged for a dollar of real value in any of the details of the expenditure. Without any choice on their part, they were obliged to expend the fixed sums at their disposal for the countless needs of their

work, receiving small values at fictitious prices, and were perhaps somewhat influenced by the expanded views of all private business men and municipalities then in vogue. If during the period named, and when these large outlays were principally made, they had not been obliged to pay common laborers from two to two and a half, and mechanics from three to four, dollars per day, and, for every form of material required, in that proportion, instead of one and two dollars per day for different kinds of labor, and material on that basis, as now, the record would have shown an expenditure of a hundred thousand dollars less than it now does.

The personal farm equipment of stock, teams, tools, implements, vehicles, and machines, was unavoidably procured on the high-price basis; and if from year to year the inventory has shown a decreased money-value, notwithstanding the increase of stock, the result can only be charged to that general depreciation of prices which has affected the entire property of the State, and plunged many careful, judicious men into ruin.

To reap the full advantage which the property acquired under these circumstances is capable of yielding, a larger annual income is required.

Though extremely desirous of securing for the institution every modern appliance of practical education and culture, and of enlarging the sphere of its influence in its special field, yet we are satisfied, that, by the practice of the most scrupulous economy in the management of its affairs, and some personal sacrifice on the part of its faculty, its future will not be devoid of usefulness.

THE SCHOOL.

Considering all the circumstances of the case, the work of the year may be pronounced a success. There has been no serious diminution in the number of students. They have manifested their usual interest in their specific routine of study, work, and drill, and in the general welfare and progress of the college. They were never before so public-spirited, and eager to contribute their effort for its improvement, as is evinced by the erection by the class of '82 of an elegant fountain, at the cost of two hundred and fifty dollars, in the centre of the grass-plat in front of the buildings, which adds

greatly to the beauty of the scene. It is worthy of note that they have taken the most lively interest in the agricultural operations of the surrounding vicinity, attending and participating in the essays and discussion of the agricultural organizations, and serving as judges, and writing reports on different departments of their exhibitions. The good has been mutual. The farming community has taken much more interest in the young men as such, as students of agriculture, and in the college, its work and progress.

An invitation having been extended to the college battalion to attend and participate, as a military organization, in the ceremonies attendant on the celebration of the settlement of Boston on the 17th of September, and our late president, Charles L. Flint, and Isaac Farnsworth, Esq., having generously offered to defray the expense of transportation, the invitation was accepted. Under the command of its military instructor, Lieut. Charles Morris, it left Amherst on Thursday, Sept. 16, after college exercises, and returned and broke ranks for home duty on the 18th. There was a doubt, in the minds of some of the college officers, of the propriety of the excursion, and fears of its influence on the students individually, and on the institution; but the result was altogether favorable. By the quiet and gentlemanly deportment of the young men when out of the ranks, and the soldierly appearance, the precision of movement, and admirable drill exhibited by the battalion in the procession and on the line of march, they won the highest praise of their commanding officer, and the warm encomiums of both friends and strangers. In the exhibition of all the qualities which combine to make an efficient military organization, it was, by the best judges, accredited as second to but one in the immense military array of the occasion.

The devotion of the officers of the different departments, and the alacrity and cheerfulness with which they discharge their increased and arduous duties, was never more marked than at present. In this connection it should be remembered, that, though the teaching-force has been seriously decreased, the regular course of instruction according to the curriculum has been retained. The branches of study taught by the discharged professors, nearly all of which were of the highest importance, have in some cases been assigned to

those who remain, and others have been continued by special instructors from abroad. In the latter cases the attempt has been successfully made to secure the services of proficient and experienced teachers in the departments to be taught. But, however advantageous this may be to the pupils, practically, it does not increase the faculty, or divide with its members the care, labor, and responsibility of the general management of college affairs.

The anniversary exercises, instead of being held in the centre of the town, a mile from the college premises, as in most former years, were conducted in the college chapel, which, though of meagre seating capacity, accommodated the different assemblies with little discomfort. This, with the fact that the musical associations of the students furnished all the music for the military parade and the in-door exercises, served to concentrate and unify the college sentiment, which apparently was shared alike by the college fraternity, friends, and visiting strangers. The exercises were attended by his Excellency the Governor, a large proportion of the board of trustees, the examining committee of the board of overseers, and a larger number than usual of citizen-farmers from the surrounding community and different parts of the State; all of whom evinced great interest in the college and its work, and expressed satisfaction with the character of the exercises. After an address pregnant with good advice to the graduates, the faculty, and trustees, congratulations at the success of the institution, and pleasure at the spirit which appeared to pervade all, the Governor delivered the diplomas of the State to the members of the graduating class, conferring the degree of bachelor of science; and the diplomas of the Boston University were delivered by the college president.

The Grinnell Prizes, offered to the members of the graduating class for the two best written and oral examinations in agriculture, and the Farnsworth Prizes, to the sophomore and freshman classes for excellence in declamation, were sharply competed for, and great interest was manifested in each. But the importance of the former exercise is not fully appreciated, and does not attract the full attention of the public which its importance deserves. While the hope of winning the fifty or thirty dollar prize may stimu-

late the members of the class to excel, and temporarily constitute the absorbing feature of the exercise, to the friends of the college and of agriculture it has a vastly more important phase. The topics selected for the examination are intended, as far as possible, to embrace the whole field of scientific agriculture, and the best modes of farm practice in all its details. And their discussion is not only an exhibit of the culture and proficiency of the members of the class, but also of the correctness, the thoroughness, and the practicability of the instruction in this most important field of the college work. There is no better method for fault-finders and friends, to determine whether the instruction is fulfilling its mission, than by attending and participating in these annual examinations as examiners, as all are earnestly urged to do. In this examination the first prize was awarded to Almon H. Stone of Phillipston, and the second to William G. Lee of Amherst. The gold medals of the Farnsworth Prizes were awarded to Samuel C. Damon of Lancaster, and David O. Nourse of Bolton; and the silver medals, to John E. Wilder of Lancaster, and Homer J. Wheeler of Bolton. The Hills Botanical Prizes, for the best general herbarium and the best collection of native woods, were awarded, the first to Almon H. Stone of Phillipston, and the second to William C. Parker of Wakefield.

Professors Goodell, Goessmann, Graves, Maynard, and Morris have each conducted their departments with ability and a good measure of success, though all, but especially the physical department, under the care of Professor Graves, are crippled by a deficiency of apparatus to make the instruction more clear and complete. The wants of the agricultural department are radical, and its equipment radically defective, and must remain so, until, by the acquisition of large means, the way is opened for the erection of commodious buildings, and the collection of illustrative material.

IMPROVEMENTS OF THE YEAR.

Great as are all the school wants which have been last enumerated, they have not been considered so immediately and economically pressing as the need of repairs to many of the buildings, some of which, by thirteen years' use and

exposure, had taken on a neglected appearance, and suffered a marked deterioration, and others were being injured by defects in the original structure: therefore, money saved from many sources has been expended in this direction.

The north college dormitory, which had settled in the centre by the decay and "brooming" up of the post-pillars in the basement, has been lifted to its original position, and supported on granite blocks bedded down to hardpan. All the wood-work on this and the other brick dormitory has been thoroughly painted and sanded. The large laboratory-chapel and drill-hall building, the dwelling-house until recently occupied by Professor Graves, the boarding-house, the Botanic Museum building, the plant-house, the old farm-house occupied by the president, and the dwelling occupied by Professor Maynard, have all been well painted; and the latter structure has been improved by erecting an addition, which makes it much more commodious and convenient, as well as increases its attractiveness. These special repairs were made at a cost of nine hundred and fifty dollars. The whole work has materially improved the appearance of the estate, and contributed to the preservation of the property. By natural wear, and perhaps somewhat by carelessness of employees, the furniture of the kitchen and dining-room of the boarding-house had become so broken and marred as to be hardly serviceable, or suitable for use. This has been replaced by new, at considerable expense; the establishment placed under the care of a competent matron who has succeeded in managing its affairs so as to preserve the college property, and make the house homelike and pleasant for the students.

The water-supply of the estate has never been in sufficient quantity, or of sufficient force, to be of any practical utility in the emergency of a fire, and recently, owing to the gradual filling-up of the reservoir with wash, and the decay of its log dam, has afforded a scant supply for ordinary use some months of the year; and, the Amherst Water Company having brought it from Pelham to the vicinity, a contract was made for taking any quantity of it which was desired, for one hundred and fifty dollars a year. An eight-inch pipe has therefore been connected with their main and the reservoir pipe, which gives an unlimited quantity to every part of

the estate, and with sufficient head to throw it over the highest building, which gives such security that it should lessen the cost of fire insurance.

The distance from building to building, which the students are obliged to walk to their various exercises and to their meals, has always made the matter of walks of great consequence; and much pains has been taken to construct and keep them in repair with gravel. But in wet weather, and in the spring and fall, the sinking of the gravel to the clay has made them any thing but desirable, and a source of great annoyance in consequence of the mud which was unavoidably carried to the halls and rooms. To obviate the difficulty, a contract was made to supply gravel from the knoll south of the president's house, to construct tarred walks in the village, compensation being made by laying such walks around the college buildings. The amount of gravel thus taken has been sufficient to construct this year an eight-foot walk from south to north college and the laboratory, and from the main entrances of the buildings to the travelled road, thence over the worst ground to the boarding-house. They are found to be a source of great convenience, of cleanliness, and a marked improvement to the general appearance of the grounds.

COLLEGE FARM.

On the abolition of the office of farm superintendent, in consequence of straitened financial circumstances, its duties practically devolved upon the professor of agriculture. But the subsequent election of that officer to the presidency has made it utterly impossible for him to give a personal supervision to the details of farm-work, or to have more than a general care of its business affairs. All details and much specific business have been committed to Mr. Henry Tillson as farm foreman, who with his family has occupied the farm-house, and boarded the persons employed as teamsters. Mr. Tillson has taken great interest in his work, and discharged his delicate and arduous duties in the care of the farm, its labor, stock, crops, and general property, with gratifying success.

For the reasons above stated, Mr. John W. Clark, a graduate of the college, who for two or three years has been

superintendent of the nurseries, has kindly assumed the care and management of the required farm-work of students. Mr. Clark, who as a student had become familiar with this exercise, has experienced no difficulty in the task, and has succeeded in maintaining the system in its usual efficiency.

Though the farm crops in certain cases have suffered somewhat for want of rain, they have been generally good, and of good quality. The following is the acreage and the crop yield of the past year, some of it given by estimation, but more by actual weight and measure: corn, ten acres on the stump pasture, yield five hundred bushels shelled corn and twenty tons fodder; sugar-beets, three acres grown for the Franklin factory, yield thirty-six tons; potatoes, four acres on the light sandy loam west of the college buildings, yield five hundred bushels; oats, on land adjoining the pasture, twenty acres, yield one thousand bushels; rye, twelve acres on the light land north of the ravine, yield two hundred and fifty bushels; oat and rye straw, thirty-five tons; mowing-land, seventy-five acres, yield of hay one hundred and fifty tons. The apple-crop of the farm was abundant, but of small market-value, and was largely fed to cattle and swine, in both the raw and cooked state, and with marked beneficial results in both cases. The live-stock has increased in number and value, the details of which will be found in the inventory of farm property annexed.

As a purely money-making and business affair, the year's operations on the farm have not been a success, though an analysis of the treasurer's report will show a deficiency of but from five to six hundred dollars. The management of the farm for this purpose never has been; and it is more than doubtful, if all the lands in their present condition are to be used for that purpose, if it ever can be. It may be said with truth, perhaps, that what the farm loses the institution gains; but that gives no brighter view of the farm-balance as such. Though farm-lands, with all their attachments, are absolutely essential as an illustration for a college of agriculture, and make a valuable return, as do other educational appliances, yet their complication with school wants and affairs makes it difficult, if not impossible, to manage them on those strict business principles which are indispensable for profit. If the prime objects of connecting farm-

lands with the college are to give practical illustration to schoolroom instruction, to give opportunity for experiments with soils, crops, and farm-stock, to give students the privllege of learning something of farm-labor, or to assist themselves to a limited extent by labor-wages, it may be seriously considered whether they could not be as well or even better secured with one hundred or one hundred and fifty acres of suitable variety and quality, as with four hundred in an unimproved condition, and whose improvement when attempted is practically a failure for want of sufficient means. If the income of the college, and the number of students, is permanently to remain as at present, it may be a matter worthy of thought whether that portion of the large farm now held, which is not needed for school purposes and experiment, might not be sold at some opportune time, and the avails invested for the increase of the annual income.

HORTICULTURAL DEPARTMENT.

The horticultural and botanical department has been conducted by Professor Maynard with his usual skill and faithfulness. Its value for educational purposes, not only to the students of the college, but also to the general community, is every year becoming more apparent. While this is its chief value, the production and sale of choice varieties of plants, but especially of nursery stock, is highly appreciated, and the demand constantly increasing. The sales from this department during the year have amounted to the sum of $2,792.76. For details respecting it, reference is made to the report of Professor Maynard annexed.

EXPERIMENT STATION.

The experiment station organized and put in operation at the college in the spring of 1878, on the basis of a meager private donation, not having been supported by public or private aid, and the officers upon whom devolved the responsibility of conducting it having been crowded with increased duties in other directions incident to the changes of the following year, has been necessarily suspended, so far as any systematic assigned work is concerned. The Sixteenth Annual Report contains a detailed account of the finished work, and of the investigations then in progress.

The experiments with sorghum as a sugar-producing plant forever settled the fact that no known variety of it can be profitably employed for that purpose, unless chemical science can discover a law by which glucose can be changed to cane-sugar.

The experiments in feeding different kinds of fruit-bearing plants with special chemical elements, to improve the quantity and quality of their products, have been continued to date; and a synopsis of their progress may be found in the annexed report of Professor Goessmann on the condition of the chemical department. The investigations into the physical deportment of certain soils to temperature and water, and its influence on plant-growth, were continued in 1879, and to a limited extent in 1880. The rainfall in the former year, at the point where the lysimeter is located, during the months from April to November, was 22.3 inches, which was equivalent to 608,430 gallons per acre. The percolation was 89.520 gallons per acre; or, of the rainfall, 14.71 per cent percolated, and 85.29 per cent evaporated. In the same months of 1880 the rainfall was 19.11 inches, equivalent to 543.620 gallons per acre. Of this, 4.75 per cent, or 25.800 gallons, percolated, and 95.25 per cent, or 517,820 gallons, evaporated. There were 64,810 gallons more water to the acre in 1879 than in 1880; but the percolation was more than three times as much in the former as in the latter year. The fall of rain in 1880 was generally small in each storm, evenly distributed, and with no percolation in four months of the six named. In 1879 the rainfall of single storms was very large, with more than a corresponding amount of percolation. In 1879 a record was kept of the temperature of dry gravel and wet peat soil in natural position, at the surface and five inches in depth, at five A.M. and half past two P.M., from April to October. The average temperature of the whole surface soil of five inches in depth, day and night for the whole time, was found to be, for gravel, 70.2°, and peat, 66.86°; a result that corroborates and sustains the conclusions of the much smaller number of observations made in 1878, to which reference is made.

Early in the year a vacancy occurred in the board of trustees by the resignation of Hon. Richard Goodman of Lenox. It was filled at a meeting in June by the election

of William Wheeler, B.S., of Concord, a graduate of the college in the class of 1871. This election is an epoch in the college history, indicating its advancement in age, and bringing the experience and sympathy of the alumni into connection with its active management, which must be to them a cause of pleasure and pride.

In 1879 a bequest of a thousand dollars to the college was received from the executors of Whiting Street of Northampton. The bequest did not specify any special purpose for which it should be used, and it was temporarily employed for contingent wants. But it has now been invested, and is to be known as the Whiting Street Fund. An examination of the treasurer's report will show, that, notwithstanding the special expenditure of nearly a thousand dollars in repairs, which cannot soon occur again, there is in his hands a balance to the credit of the college of $1,238.01.

Respectfully submitted by order of the trustees.

LEVI STOCKBRIDGE, *President.*

AGRICULTURAL COLLEGE, AMHERST,
Jan. 12, 1881.

THE CHEMICAL DEPARTMENT.

REPORT BY PROFESSOR CHARLES A. GOESSMANN.

The entire course of instruction in theoretical and experimental chemistry during the past year has been given in accordance with the lately revised plan of studies. The change in transferring the branches of applied chemistry from the sophomore to the junior and senior year has proved very acceptable to both the students and the teacher. The attendance of all classes engaged in the various exercises of the department has been quite satisfactory, and their progress, on the whole, encouraging. The chemical laboratory is kept open five days during the week, four hours in the forenoon of each day, to accommodate all who wish to pursue a special course in practical chemistry. Several post-graduates have availed themselves of this opportunity during the past year; and quite a number of students of all classes have spent their spare hours in some practical laboratory-work suited to their particular state of information, or related to their future special occupation. This course of action, judging from past experience, serves two purposes, — it creates among the students a desirable interest in the study of chemistry, and aids essentially in procuring the pecuniary means to meet the unavoidable expenses of the department, as far as the regular instructions specified in the college curriculum necessitate. The expenses of the department have been kept, as in past years, within its income from the fees charged to those who take part in laboratory exercises.

Aside from the regular class duties, much time has been devoted to analytical chemical investigations in various directions. The examination of the commercial fertilizers offered for sale in our markets, as well as the composition of noted refuse materials recommended for fertilizing purposes, have received careful attention. The results of this work

will be published, in conformity with our State laws for the regulation of the trade in "commercial fertilizers," through the coming report of the secretary of the State Board of Agriculture. The inquiry into the action of special fertilizers upon the quantity and the quality of fruit, mentioned already in a previous annual report, has been continued. Although some interesting facts have been noticed, it seems advisable to defer their publication, in the interest of a more complete presentation, to a future suitable occasion. Some active part has also been taken in securing desirable material for the examination of the chemical composition, and the comparative agricultural value of reputed fodder-crops of Europe, new to our farm industry. Forty varieties of seeds of forage plants, secured from a reliable seed-dealer in Germany, have been handed over for cultivation to the botanical department, where they receive a careful attention. In this connection, it gives me particular pleasure to state that I have enjoyed, throughout the entire course of my experimental field-work, the hearty co-operation of Professor Maynard, to whose report I leave the task of describing the details of the latter.

REPORT OF BOTANIC DEPARTMENT.

BY PROFESSOR SAMUEL T MAYNARD.

INSTRUCTION.

The freshman and sophomore classes have been instructed in botany and drawing; the junior class, in theoretical and practical horticulture; and the senior class, in botany, microscopy, and landscape-gardening.

BOTANY.

The method pursued in the study of botany has been, first, to give the student a thorough knowledge of the structure of plants and the function of each part, using the microscope to show the actual appearance.

This is followed by the study of systematic botany, devoting most of the time to the study of the more common plants (such as weeds and grasses), and other useful plants. The one term with the senior class was devoted to systematic botany, giving particular attention to the characteristics of the different divisions, classes, and families, especially the injurious fungi and other cryptogamic plants, with the aid of the microscope.

HORTICULTURE.

In horticulture the limited time assigned was devoted to the most practical points in the cultivation of fruits, trees, shrubs, and flowers, and the construction and care of greenhouses, pits, hot-beds, and cold-frames, etc. It has been my aim to give each student actual practice, in the field and greenhouse, in every branch of the subject taken up in the class-room. In order to make this branch of instruction as valuable as it ought to be, more time should be allowed, as it is impossible to do justice to the large range of subjects that ought to be taken up in one term of two hours each

week. I would suggest that but four hours each week for the summer and fall terms be devoted to class-work, and that the two hours thus gained be employed in the instruction of horticulture.

MICROSCOPY.

The course of instruction consists in the study of the microscope itself, how to use it properly, and, at the same time, taking up a careful and systematic study of plant-tissue.

This enables the student to review the entire subject of the structure and uses of the various organs of plant-growth, while he is gaining knowledge of the manipulation and care of the microscope.

LANDSCAPE-GARDENING.

The time assigned to this subject was taken up in the study of the most important trees and shrubs used for ornamental purposes, together with the principles upon which are based the artistic arrangement of trees, shrubs, flowers, walks, lawns, buildings, etc.

DRAWING.

This work, although not directly in the line of botany or horticulture, was assigned to me for want of better arrangements. The course with the freshman class has been instruction in freehand drawing, giving most of the time, after the study of some of the elementary principles, to object drawing. The sophomore class have received instruction in instrumental drawing, taking up such work as making plans of buildings from actual measurement, after the preliminary instruction in the care and use of the instruments. Both classes have made good progress, considering the limited time given to the elementary instruction.

GREENHOUSES AND FRAMES.

The Durfee plant-house, while a very ornamental structure, and a good one in which to keep large specimens for instructional purposes, is not adapted to the use we are now obliged to make of it; i.e., the growing of plants for the trade.

The sash-bars and other parts of the structure are sadly in

need of repairs and painting. Material has been cut for the renewal of the walks and benches, and drawn to the mill for sawing.

To put this house and the new one in thorough repair will require the expenditure of from three to five hundred dollars.

The lower wood-work outside of the large house, the sash of the new one, and between sixty and seventy of the cold-frame sashes have been painted the past season.

This work was done wholly by students, as are all the repairs of glass, and many other things, which, in other departments, are done by assistance from outside.

CROPS.

The farm crops grown have been, — corn, two acres; oats, one and a half acres; potatoes, one acre; pease, an eighth of an acre; squashes, three-quarters of an acre; early cabbages, half an acre; late cabbages, a quarter of an acre. About two tons and a half of hay have been cut, and put into the barn in good condition, and about the same amount sold standing.

The fruit-crop has been above the average; peaches and grapes being very good, raspberries and blackberries fair, and strawberries light.

The sales of plants have been larger than in previous years. The total sales of trees, plants, fruit, and vegetables, amount to $2,796.72. Of this amount, $630.27 are the sales of the nursery.

About three acres and a half of land north-east from the pear-orchard have been seeded down the past season, and one and a half acres south of the plant-house were turned over and reseeded. Three-quarters of an acre was planted with strawberries last spring, and the old plantation ploughed under, after the crop had been gathered. The new plantation bids fair to be the best piece we have ever had.

NURSERY.

About five acres are devoted to the growth of trees, shrubs, vines, etc., which are in a very flourishing condition, the sales the past year amounting to a little over six hundred dollars, with orders for the spring trade for nearly three hundred dollars more.

The sales up to the present time have been largely of stock on hand at the time of starting the business, or which has been bought in to be resold.

After the present year, nearly every thing sold will be of our own growing.

Among the stock that is particularly fine are about six thousand peach-trees one year from bud, several thousand apple-trees three years from root-graft, with a good stock of vines, shrubs, small fruits, and a large and very complete stock of the various varieties of retinosporas and the more dwarf arborvitæs.

NEW PLANTS AND FRUITS.

Several of the new plants introduced by Col. Clark from Japan promise to be very valuable. Among them are the vigorous and hardy vine *Actinidia polygama*, and the beautiful deciduous tree *Cercidophyllum*. We are fortunate in having a good stock of the above, as well as of the noted umbrella-pine. The climbing hydrangea which was introduced at the same time is very slow in growth, and requires more time to prove whether it will be valuable or not. In the pear-orchard are several trees grafted with the promising new pears originated by Francis Dana, Esq., the stock of which was kindly sent us by Col. Stone of Dedham. The grafts have made a good growth, and will probably bear the coming season. The names of the varieties are President Clark, Francis Dana, Student, and Crumbs-of-Comfort.

As the first has been favorably mentioned by the committee of the Massachusetts Horticultural Society, I think it desirable to propagate a few of them for sale.

EXPERIMENTS.

In the pear-orchard, upon alternate rows, has been sown iron in two forms, to determine its effect upon the growth of the tree, and particularly upon the diseases to which they are liable. Upon the first row was sown Navassa phosphate containing a large per cent of iron, about two pounds to each tree; upon the second row was applied the same quantity of iron filings and sweepings from the blacksmith's shop. This course was continued through the orchard, and extended to the peach-trees and a few rows of vines in the vineyard.

In the peach-orchard, experiments have been made for several years to determine the effect of severe pruning and an abundance of plant-food, particularly the chloride of potassa, upon the disease known as the "yellows." The results have been so marked, that we hope to be able to show that the disease is due to the exhausted condition of the soil, and the injuries of the borer, and that a remedy is in the hands of every cultivator. In fact every experiment we have made upon the various diseases attacking plant-life leads us to the conclusion that fungoid growths only attack living plants when they are in an unnatural or unhealthy condition.

A large collection of grasses and forage plants has been grown in plats twelve feet square, and each kind carefully labelled with both the Latin and common name, so that students and others can make a study of their characteristics.

It is proposed to make this collection as complete as possible by adding all the grasses and forage plants of any value that we can obtain.

A small plat of sugar-beets was grown from seed obtained by Dr. Goessmann from France and Germany.

Although the results were not as satisfactory as could be desired, it is hoped, by the application of special fertilizers, to produce a variety that will yield a larger per cent of sugar than any now grown in this country. A fine lot of seed was grown from a small lot of roots imported at the same time as the seed, which will serve as a basis for next year's experiment.

The experimental fruit-plats carried on for Dr. Goessmann are in a good growing condition.

From each of the five plats, strawberries of two varieties were gathered for analysis; and the coming season will yield raspberries, currants, gooseberries, and possibly grapes, from which something of the effects of the different fertilizers upon the character of the fruit may be determined.

Our knowledge of plant-life, and the effects of the different fertilizing elements upon their growth, must largely depend upon the work of the chemist; and no institution can boast of better facilities for original work than our own.

Upon the east side of the above plats, it is proposed to devote a narrow strip of land to the growth of the newer small fruits.

IMPROVEMENTS.

A border of trees and shrubs was planted last spring, beginning near the new propagating-house, and extending south of the large houses and a short distance along the main road toward the village. These have made a good growth, and, in a year or two, will add much to the beauty of the place. The willow hedge above the large house, having become a nuisance as a harbor for insects and vermin, and by the exhaustion of the soil upon either side, has been pulled out by the roots, and burned, and the space devoted to the growth of pear-seedlings.

It is proposed to obtain the desired wind-break by planting a row of hemlocks and spruces along the north side of the road leading to Col. Clark's.

LABOR.

The labor of the department the past year has been nearly all done by students; and, while it may not be as profitable as if done by more regular help, yet there is great pleasure in having the work done by young men who desire to learn, and who are faithful and intelligent in the discharge of their duties.

The main difficulty in the way of the successful employment of students' labor is in our inability to arrange for their irregular work.

This requires a thorough equipment and some skilled labor to assist in the preparation.

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COURSE OF STUDY AND TRAINING.

FRESHMAN YEAR.

First Term. — Chemistry, 3 hours each week; Human Anatomy, Physiology, and Hygiene, 3 hours; Algebra, 5 hours; English, 2 hours; Agriculture, 2 hours; Declamation, 1 hour; Military Drill, 4 hours; Manual Labor, 6 hours.

Second Term. — Inorganic Chemistry, 3 hours; Botany, 3 hours; Geometry, 5 hours; Agriculture, 3 hours; English, 2 hours; Elocution, 1 hour; Freehand Drawing, 3 hours; Military Drill, 3 hours.

Third Term. — Systematic Botany, 4 hours; Geometry, 4 hours; French, 5 hours; Elocution, 2 hours; Agriculture, 2 hours; Military Drill, 4 hours; Manual Labor, 6 hours.

SOPHOMORE YEAR.

First Term. — Systematic Botany, 3 hours each week; Geometry, 4 hours; French, 5 hours; English, 1 hour; Agriculture, 2 hours; Declamation, 1 hour; Military Drill, 4 hours; Manual Labor, 6 hours.

Second Term. — Geology, 3 hours; Trigonometry, 5 hours; French, 4 hours; English, 1 hour; Agriculture, 3 hours; Declamation, 1 hour; Drawing, 3 hours; Military Drill, 3 hours.

Third Term. — Zoölogy, 5 hours; Surveying, 5 hours; Agriculture, 2 hours; English, 3 hours; Declamation, 1 hour; Levelling, 3 hours; Military Drill, 4 hours; Manual Labor, 6 hours.

JUNIOR YEAR.

First Term. — German, 5 hours each week; Mechanics, 5 hours; Entomology, 2 hours; Market-Gardening, 2 hours; Horticulture, 2 hours; Military Drill, 3 hours; Manual Labor, 6 hours.

Second Term. — German, 4 hours; Physics, 5 hours; Practical Chemistry, 9 hours; Drawing, 3 hours; Agricultural Debate, 1 hour; Declamation, 1 hour; Military Drill, 3 hours.

Third Term. — German, 4 hours; Astronomy, 4 hours; Practical Chemistry, 9 hours; Declamation, 1 hour; Stock and Dairy Farming, 2 hours; Military Drill, 4 hours; Manual Labor, 6 hours.

SENIOR YEAR.

First Term. — English Literature, 4 hours each week; Practical Chemistry, 7 hours; Book-keeping, 2 hours; Roads and Railroads, 3 hours; Military Science, 2 hours; Original Declamation, 1 hour; Military Drill, 3 hours.

Second Term. — English Literature, 4 hours; Theses, 1 hour; Mental Science, 4 hours; Agriculture, 2 hours; Veterinary Science, 3 hours; Military Science, 2 hours; Microscopy, 4 hours; Military Drill, 3 hours.

Third Term. — Veterinary Science, 2 hours; Military Science, 2 hours; Botany, 3 hours; Landscape-Gardening, 3 hours; Rural Law, 1 hour; Lectures on English Language, 2 hours; Theses, 1 hour; Agricultural Review, 4 hours; Military Drill, 4 hours.

CALENDAR FOR 1881.

The third term of the collegiate year begins March 24, and continues till June 22.

The first term begins Aug. 25, and continues till Nov. 23.

The second term begins Dec. 8, and continues till March 8, 1882.

There will be an examination of candidates for admission to the college, at the Botanic Museum, at nine o'clock A.M., Tuesday, June 21, and also on Thursday, Aug. 25.

The Farnsworth Prize declamations take place Monday evening, June 20.

The public examination of the graduating class for the Grinnell Prize for excellence in agriculture, and the examination of the other classes in the studies of the term, will take place on Tuesday forenoon, June 21.

The exercises of graduation day occur June 22.

ADMISSION.

Candidates for admission to the freshman class are examined, orally and in writing, upon the following subjects: English grammar, geography, arithmetic, algebra through simple equations, and the history of the United States.

Candidates for higher standing are examined as above, and also in the studies gone over by the class to which they may desire admission.

No one can be admitted to the college until he is fifteen years of age; and every student is required to furnish a certificate of good character from his late pastor or teacher, and to give security for the prompt payment of term-bills. Tuition and room-rent must be paid in advance at the beginning of each term; and bills for board, fuel, etc., at the end of every term.

The regular examinations for admission are held at the Botanic Museum, at nine o'clock A.M., Tuesday, June 21, and on Thursday, Aug. 25; but candidates may be examined and admitted at any other time in the year.

EXPENSES.

Tuition	$12 00 per term.
Room-rent	$5 00 to 10 00 "
Board	2 50 to 3 50 per week.
Expenses of chemical laboratory to students of practical chemistry	10 00 per term.
Public and private damages, including value of chemical apparatus destroyed or injured	At cost.
Annual expenses, including books	$250 00 to $350 00

REMARKS.

The regular course of study occupies four years; and those who complete it receive the degree of bachelor of science, the diploma being signed by the Governor of Massachusetts, who is president of the corporation.

Regular students of the college may also, upon application, become members of Boston University, and, upon graduation, receive its diplomas in addition to that of the college, thereby becoming entitled to all the privileges of its alumni.

The instruction in the languages is intended to qualify the graduates to write and speak English with correctness

and effect, and to translate French with facility. The scientific course is as thorough and practical as possible; and every science is taught with constant reference to its application to agriculture and the wants of the farmer.

The instruction in agriculture and horticulture includes every branch of farming and gardening which is practised in Massachusetts, and is both theoretical and practical. Each topic is discussed thoroughly in the lecture-room, and again in the plant-house or field, where every student is obliged to labor. The amount of required work, however, is limited to six hours per week, in order that it may not interfere with study. Students are allowed to do additional work for wages, provided they maintain the necessary rank as scholars.

Indigent students are allowed to do such work as may offer about the college or farm buildings, or in the field; but it is hardly possible for one to earn more than from fifty to one hundred dollars per annum, besides performing other duties. So far as is consistent with circumstances, students will be permitted to select such varieties of labor as they may, for special reasons, desire to engage in.

Those who pursue a select course attend recitations and lectures with the regular classes; but those properly qualified, who desire special instruction in botany, chemistry, civil engineering, veterinary science, agriculture, or horticulture, may make private arrangements with the officers having charge of those departments.

An expenditure of from ten to fifty dollars is necessary to provide furniture, which may be purchased at reasonable rates, either new or second-hand. At the beginning of the second term of attendance each student is required to provide himself with the full uniform prescribed for the battalion of agricultural cadets, the cost of which is about thirty dollars.

On Sundays students are required to attend church in the forenoon, and invited to join a class for the study of the Bible in the afternoon. They will be permitted to select their place of attendance from among the churches in the town, of the following denominations: viz., Baptist, Congregational, Protestant Episcopal, Methodist Episcopal, and Roman Catholic.

POST-GRADUATE COURSE.

Graduates of colleges and scientific schools may become candidates for the degree of doctor of science, or doctor of philosophy, from the college or from the university, and pursue their studies under the direction of Professor Goessmann in chemistry, or other members of the faculty in their respective departments.

BOOKS, APPARATUS, AND SPECIMENS IN NATURAL HISTORY.

The library of the college contains about two thousand volumes. Among them are several sets of cyclopædias, magazines, and newspapers, reports of agricultural societies and State boards of agriculture, and many standard works on agriculture and horticulture. There are also many useful works of reference in chemistry, botany, surveying, and drawing.

The faculty and students also have the privilege of drawing books from the excellent library of Amherst College, which contains over thirty thousand volumes.

The State cabinet of specimens, illustrating the geology and natural history of Massachusetts, has been removed from Boston to the college, and is of much value for purposes of instruction.

The Knowlton herbarium contains more than ten thousand species of named botanical specimens, besides a large number of duplicates. The Botanic Museum is supplied with many interesting and useful specimens of seeds, woods, and fruit-models. There is also a set of diagrams illustrating structural and systematic botany, including about three thousand figures.

About fifteen hundred species and varieties of plants are cultivated in the Durfee plant-house, affording much pleasure and information to students and visitors.

The class in microscopy has the use of seven of Tolles's best compound microscopes, with objectives from four inches to one-eighth of an inch in focal distance, and a variety of eye-pieces.

PRIZES.

FARNSWORTH RHETORICAL MEDALS.

Isaac D. Farnsworth, Esq., of Boston, has generously provided a fund of fifteen hundred dollars, which is to be used for the purchase of gold and silver medals, to be annually awarded, under the direction of the college faculty, for excellence in declamation.

GRINNELL AGRICULTURAL PRIZES.

Hon. William Claflin of Boston has given the sum of one thousand dollars for the endowment of a first prize of fifty dollars, and a second prize of thirty dollars, to be called the Grinnell Agricultural Prizes, in honor of George B. Grinnell, Esq., of New York. These prizes are to be paid in cash to those two members of the graduating class who may pass the best oral and written examination in theoretical and practical agriculture.

HILLS BOTANICAL PRIZES.

For the best herbarium collected by a member of the class of 1880, a prize of fifteen dollars is offered, and, for the second best, a prize of ten dollars; also a prize of five dollars for the best collection of woods, and a prize of five dollars for the best collection of dried plants from the college farm.

REGULATIONS.

I. — Students are forbidden to combine for the purpose of absenting themselves from any required exercise, or violating any known regulation of the college.

II. — The roll shall be called five minutes after the ringing of the bell, for each exercise of the college, by the officer in charge, unless a monitor be employed; and students who do not answer to their names will be marked absent, provided that any student coming in after his name has been called shall be marked tardy. Two tardinesses shall be reckoned as one absence.

III. — Absence from a single exercise may be allowed or excused by the officer in charge of the same, if requested beforehand; but permission to be absent from several exer-

cises must be obtained in advance from the general excusing officer, or from the president. In such cases the officer excusing will furnish a certificate of excuse, which shall state the precise time for which absence is permitted, and which shall be a satisfactory reason for absence from all exercises occurring within the time specified.

IV. — Excuses for all absences, whether with permission obtained beforehand or not, must be submitted to the excusing committee. They must be rendered promptly within one week from the date of absence, and those deemed unsatisfactory will be returned to the student with the indorsement of the committee.

V. — Whenever the aggregate number of unexcused absences in all departments reaches five, the student so delinquent shall be informed of the fact; when the number of such absences reaches eight, the parent or guardian of the student shall be informed of his delinquency; and, when ten such delinquencies are justly recorded against any student, his connection with the college may be terminated.

VI. — Students are forbidden to absent themselves without excuse from the regular examinations, to give up any study without permission from the president, or to remove from one room to another without authority from the officer in charge of the dormitory buildings; and no student shall be permitted to make such change until he has procured from the inspecting officer a written statement that the room about to be vacated is in perfect order.

VII. — Students shall be required to attend the church of their selection regularly on Sunday morning, and report in writing to the excusing officer, during the ensuing week, whether they attended or not.

VIII. — The record of deportment, scholarship, and attendance, will be carefully kept; and, whenever the average rank of a student falls below fifty, he will not be allowed to remain a member of the college, except by a special vote of the faculty. Admission to the college, and promotion from class to class, as well as to graduation, are granted only by vote of the faculty.

IX. — Students are required to abstain from any thing injurious to the buildings and other property of the college, and in all respects to conduct themselves with propriety.

X. — Parents and guardians are specially urged to co-operate with the faculty in securing the faithful attendance of students upon every appointed exercise of the college.

SIZE OF ROOMS.

For the information of those desiring to carpet their rooms, the following measurements are given: In the south dormitory the main corner-rooms are fifteen by eighteen feet, and the adjoining bedrooms eight by twelve feet. The inside rooms are fourteen by fifteen feet, and the bedrooms eight by eight feet. In the north dormitory the corner-rooms are fourteen by fifteen feet, and the annexed bedrooms eight by ten feet; while the inside rooms are thirteen feet and a half by fourteen feet and a half, and the bedrooms eight by eight feet.

SCHOLARSHIPS.

The income of the Robinson fund of one thousand dollars, the bequest of Miss Mary Robinson of Medfield, is assigned by the faculty to such indigent student as they may deem most worthy.

The trustees voted in January, 1878, to establish one free scholarship for each of the eleven congressional districts of the State. Applications for such scholarships should be made to the representative from the district to which the applicant belongs. The selection for these scholarships will be determined as each member of Congress may prefer; but, where several applications are sent in from the same district, a competitive examination would seem to be desirable. Applicants should be good scholars, of vigorous constitution, and should enter college with the intention of remaining through the course, and then engaging in some pursuit connected with agriculture. To every such student the cash value of a scholarship is one hundred and forty-four dollars.

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